National Park Service
U.S. Department of the Interior

Animal and Plant Health Inspection Service
U.S. Department of Agriculture

Texas Department of Health

Big Bend National Park
Guadalupe Mountains National Park
Amistad National Recreation Area
Texas

Oral Rabies Vaccination Program
Environmental Assessment /Assessment of Effect
April 2003

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Assessment of Effect

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Guadalupe Mountains National Park
Amistad National Recreation Area
Texas

Summary

This Environmental Assessment (EA) documents the analysis of the potential environmental effects of a proposal to involve the U.S. Department of Interior (USDI), National Park Service (NPS) in an oral rabies vaccination (ORVAC) program at Big Bend National Park (BBNP), Guadalupe Mountains National Park (GMNP), and Amistad National Recreation Area (ANRA) in west-central Texas. The program would involve the distribution of ORVAC baits to create zones of vaccinated target species that would then serve as barriers to further cease the advancement of gray fox rabies virus variants. The proposed ORVAC program would reduce the possibility of humans and animals becoming infected with the gray fox variant of the rabies virus and would support the state of Texas in the effort of reducing or eliminating this strain of the virus from West-Central Texas. No cumulative impacts are anticipated from the distribution of ORVAC into the environment.

Public Comment

If you wish to comment on the environmental assessment, you may mail comments to the name and address below. This environmental assessment will be on public review for 30 days. Please note that names and addresses of people who comment become part of the public record. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

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EXECUTIVE SUMMARY

This Environmental Assessment (EA) documents the analysis of the potential environmental effects of a proposal to involve the U.S. Department of Interior (USDI), National Park Service (NPS) in an oral rabies vaccination (ORVAC) program at Big Bend National Park (BBNP), Guadalupe Mountains National Park (GMNP), and Amistad National Recreation Area (ANRA) in west-central Texas. The EA analyzes a number of environmental issues or concerns with the oral rabies vaccine and activities associated with the program.

The state of Texas is involved in an ORVAC program to stop the spread of specific gray fox (*Urocyon cinereoargenteus*) rabies variants or "strains" of the rabies virus. If not stopped, these strains could potentially spread to a much broader area of Texas and the U.S. and cause substantial increases in public and domestic animal health costs because of increased rabies exposures. The proposed action would be conducted in cooperation with the Texas Department of Health (TDH), U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS), and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve the distribution of ORVAC baits to create zones of vaccinated target species that would then serve as barriers to further cease the advancement of gray fox rabies virus variants. The action would involve the use of APHIS-WS federal funds to purchase and distribute ORVAC baits.

The proposed ORVAC program would reduce the possibility of humans and animals becoming infected with the gray fox variant of the rabies virus and would support the state of Texas in the effort of reducing or eliminating this strain of the virus from West-Central Texas. No cumulative impacts are anticipated from the distribution of ORVAC into the environment. The ORVAC vaccine and bait that would be used has been found safe to use on gray fox and other animal species, has a low risk of causing adverse affects to humans, is readily consumed by target animal species, and does not cause bioaccumulation in the environment. A limited number of baits would be distributed one time per year, thereby limiting the potential for persons to be exposed to an ORVAC bait or to bait distributing equipment.

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1.1 BACKGROUND

1.1.1 Introduction

Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal. The disease can be effectively prevented in humans and many domestic animal species, but abundant and widely distributed reservoirs among wild mammals complicate rabies control. Within most of the U.S., these reservoirs occur in geographically discrete regions where the virus transmission is primarily between members of the same species (Krebs et al. 2001). These species include but are not limited to raccoons (*Procyon lotor*), coyotes (*Canis latrans*), skunks (primarily *Mephitis mephitis*), gray foxes (*Urocyon cinereoargenteus*), and red foxes (*Vulpes vulpes*). Species specific variants of the virus may be transmitted to other animal species. However these encounters rarely result in sustained virus transmission within that animal species. Once established, virus transmission within a specific animal species can persist at epidemic levels for decades, even perhaps for centuries (Krebs et al. 2001).

The vast majority of rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in raccoons, skunks, and bats (Order *Chiroptera*). Red foxes account for less than 10% of the reported rabies cases, with domestic cats, dogs and cattle among those most often reported (CDC 2001a). Two canine rabies epidemics emerged in Texas in 1988, one involving coyotes and dogs in South Texas and the other in gray foxes in West/Central Texas. The South Texas epidemic alone has resulted in two human deaths and caused over 3,000 people to receive postexposure rabies treatment (TDH 2001).

1.1.2 Public health importance of rabies.

Over the last 100 years, rabies in the U.S. has changed dramatically. About 90% or greater of all animal cases reported annually to CDC now occur in wildlife (Krebs et al. 2000; CDC 2001a). Before 1960 the majority of cases were reported in domestic animals. The principal rabies hosts today are wild carnivores and bats. The number of rabies related human deaths in the U.S. has declined from more than 100 annually at the turn of the century to an average of one or two people/year in the 1990s. Modern day prophylaxis, which is the series of vaccine injections given to people who have been potentially or actually exposed, has proven nearly 100% successful in preventing mortality when administered promptly (CDC 2001a). In the U.S., human fatalities associated with rabies occur in people who fail to seek timely medical assistance, usually because they were unaware of their exposure to rabies.

Although human rabies deaths are rare, the estimated public health costs associated with disease detection, prevention, and control have risen, exceeding $300 million annually. These costs include the vaccination of companion animals, maintenance of rabies laboratories, medical costs, such as those incurred for exposure case investigations, rabies post-exposure prophylaxis (PEP) and animal control programs (CDC 2001a).

Accurate estimates of these expenditures are not available. Although the number of PEPs given in the U.S. each year is unknown, it is estimated to be about 40,000. When rabies becomes epidemic or prevalent in a region, the number of PEPs in that area increases. Although the cost varies, a course of rabies immune globulin and five doses of vaccine given over a 4 week period typically exceeds $1,000 (CDC 2001a) and has been reported to be as high as $3,000 or more (Meltzer 1996). In Massachusetts during 1991-95, the median cost for PEP was $2,376 per person (CDC 2001b). Also, as epidemics spread in wildlife populations, the risk of “mass” human exposures requiring treatment of large numbers of people that contact individual rabid domestic animals infected by wild rabid animals increases. One case in Massachusetts involving contact with, or drinking milk from, a single rabid cow required PEPs for a total of 71 persons (CDC 2001b). The total cost of this single incident exceeded $160,000 based on the median cost for PEPs in that state. Perhaps the most expensive single mass exposure case on record in the U.S. occurred in 1994 when a kitten from a pet store in Concord, NH tested positive for rabies after a brief illness. As a result of potential exposure to this kitten or to other potentially rabid animals in the store, at least 665 persons received postexposure rabies vaccinations at a total cost of more than $1.1 million (Noah et al. 1995).

1.1.3 Development of ORVAC and ORVAC baits.

Although the concept of ORVAC to control rabies in free ranging wildlife populations originated in the U.S. (Baer 1988), it has a longer history of implementation in Europe and Canada. The emergence of raccoon rabies in the U.S. during the 1970s heightened interest in the application of ORVAC to raccoons. Due to biological and ecological differences among the types of animals that transmit rabies, development of specific vaccine and bait combinations was needed. One of the main difficulties was the development of a safe and effective vaccine for raccoons. In contrast to red foxes, which were the primary subjects of ORVAC programs in Europe and Canada, raccoons were not readily immunized by the oral route with the modified "live virus" vaccines that worked well in foxes (Rupprecht et al. 1988). Furthermore, modified "live virus" vaccine pose a small risk of causing vaccine-induced rabies, and have resulted in some cases of vaccine-induced rabies in animals (but no cases in humans) during oral baiting programs in Europe and Canada (Wandeler 1991).

As a consequence of field safety testing in the early 1990's, a genetically engineered, vaccinia-rabies glycoprotein (V-RG) vaccine was conditionally USDA licensed for vaccination of free-ranging raccoons in 1995 and fully licensed in 1997 in the U.S. (Hanlon et al. 1999). It remains the only effective vaccine licensed for use in the U.S. and Canada for raccoons (CDC 2000). It has also been approved for experimental use by USDA, APHIS, Veterinary Services (VS), Center of Veterinary Biologics for vaccination of free-ranging wild gray foxes and coyotes in Texas (CDC 2001a, Hanlon et al. 1999).

V-RG vaccine has proven to be orally effective in raccoons, coyotes and foxes (USDA 2001, Oertli et al. 2002). This genetically engineered vaccine was extensively laboratory-tested for safety in more than 50 animal species with no adverse effects regardless of route or dose (Rupprecht et al. 1992a). In addition, a domestic animal's annual rabies vaccination can be safely administered even if it recently ingested a dose of oral rabies vaccine (Oertli et al. 2002).

The vaccinia-rabies glycoprotein vaccine used by the ORVAC program is commercially available from MERIAL, 115 Transtech Drive, Athens, GA 30601 under the registered name Raboral V-RG®. Throughout the remainder of this document, Raboral V-RG® is referred to as "V-RG". As a recombinant vaccine, the letter "V" is used to denote vaccinia, the self-replicating pox virus that serves as the vector (i.e., carrier) for the rabies virus gene that is responsible for the production of rabies glycoprotein. The letters "RG" stand for rabies glycoprotein which is the protective sheath around the bullet-shaped rabies virus core. The glycoprotein by itself is non-infective and cannot cause rabies, but it serves as an "antigen" which means it elicits an immune response to rabies when the vaccine is swallowed by raccoons, foxes, or coyotes. There is no possibility of vaccine-induced rabies with V-RG because the vaccine only contains the non-infective surface protein of the rabies virus; none of the viral nuclear material (i.e., RNA) which would be required for the rabies virus to replicate is present in the vaccine. Over 23 million doses have been distributed in the U.S. since 1990 with only one case of vaccinia virus infection reported in humans (resulting in localized skin rashes) to date (Rupprecht et al. *unpublished* 2000, O'Reilly, CDC, pers. comm. 2003).

A number of studies have been conducted to determine the best bait formulations and strategies for delivery of ORVAC vaccines to raccoons (Hanlon et al. 1989, Hable et al. 1992, Hadidian et al. 1989, Linhart et al. 1991, Linhart et al. 1994), gray fox (Steelman et al. 1998, 2000), and coyotes (Linhart et al. 1997, Farry et al. 1998a, 1998b). When raccoons, foxes or coyotes eat oral rabies baits and puncture a sachet[1] containing the vaccine, the vaccine is swallowed and bathes the lymphatic tissue in the throat area and initiates the immunization process. The baits are small blocks of fishmeal (for coyotes and raccoons) or dog food (for gray foxes) that are held together with a polymer binding agent and are considered to be "food grade" materials (Figure 1-1). The baits are rectangular or square in shape with hollow centers. The sachet containing the liquid vaccine is contained in the hollow center of the bait (Figure 1-2). The sachet is composed of a thin plastic material that is not readily digested by the animal ingesting the bait and is subsequently passed through the animal's digestive tract. "Coated" sachets with a simple fishmeal

[1] A thin plastic packet much like those in which condiments (e.g., catsup, mustard) are provided at fast food restaurants.

attractant coating have also been field tested with effectiveness that appears to be comparable to fishmeal polymer baits containing the sachet (Linhart et al. *unpublished* 2001). Using the "coated" sachet may be equal in effectiveness at lower cost per vaccinated target wild animal. All baits are marked with a warning label that includes a phone number to call for additional information (Figure 1-1).

Figure 1-1. Oral rabies vaccination bait showing warning label and toll-free telephone number to call for information (photo by K. Nelson, APHIS-WS, Vermont).

Figure 1-2. Oral rabies vaccination bait broken open to show the sachet containing the vaccine liquid.

In field tests conducted in the U.S., the majority of ORVAC baits have been consumed within the first 7 to 14 days after placement, with reports of up to 100% of the baits being consumed within a 7 day period (Farry et al. 1998b, Hable et al. 1992, Hadidian et al. 1989, Hanlon et al. 1989, Linhart et al. 1994, Steelman et al. 2000; USDA 1995a). The likelihood of a bait being consumed is dependent upon several

factors including animal population densities (target and non-target species), bait preference, and the availability of alternative food sources. Those baits that are not consumed may remain in the environment for several months after placement dependent upon environmental conditions (precipitation, temperature, etc.) and the condition of the baits. The V-RG virus that is not consumed by the target species or other vertebrates will become inactivated over a relatively short time period. Persistence and stability of the V-RG virus outside of an organism is highly dependent on ambient temperature and local environmental conditions, the higher the temperature the quicker the virus will become inactive (USDA 1992; USDA 1995a). For example at temperatures between 68 and 100 degrees Fahrenheit the liquid viral vaccine potency remains stable for approximately 14 to 7 days, respectively, in the un-punctured sachet or inside the bait. In situations where the bait and sachet is damaged inactivation of the V-RG virus will occur more rapidly.

1.1.4 Development of ORVAC Programs in the United States.

Oral wildlife vaccination for rabies control has been under field evaluation in the U.S. since 1990. At that time a limited field release of the recombinant vaccine occurred on Parramore Island, VA to evaluate the potential effects that V-RG baits may have on free-ranging raccoon populations (Hanlon et al. 1998). As a result of this field trial and subsequent trials elsewhere an effective V-RG has been developed to control species specific rabies variants to complement other methods of rabies prevention and control including public education, domestic animal vaccination, and human PEP.

Since 1990, the number of vaccine-laden baits distributed in the U.S. rose exponentially to over 800,000 being distributed annually by 1997 (USDA 2001). Eleven subsequent field projects have been conducted or are in progress in Pennsylvania, New Jersey, Massachusetts, Florida, New York, Vermont, Ohio, Maryland, Virginia, West Virginia, and Tennessee (USDA 2001). Since 1995, ORVAC baits have been distributed in south and west-central Texas for control of rabies strains in coyotes and gray foxes (TDH 2001, USDA 2001).

1.1.5 Texas Gray Fox and Coyote ORVAC Program

In 1988, two canine rabies epidemics emerged in Texas, one involving coyotes and dogs in South Texas and the other in gray foxes in West-Central Texas. The south Texas canine rabies epidemic alone has resulted in over 3,000 people receiving postexposure rabies treatment. In 1994, the public health threat created by these two expanding epidemics prompted the Governor of Texas to declare rabies a public health emergency in the state (Clark and Wilson 1995). In February 1995, the TDH initiated an ORVAC program with a goal of halting the spread of the virus among these two wild canine species (Ernest et al. 2002).

The TDH, along with APHIS-WS, Texas Wildlife Damage Management Service, Texas National Guard, CDC, Dynamic Aviation Group Inc., U.S. Army Veterinary Lab, and other agencies involved with rabies control of wildlife and domestic animal species are presently involved in an ORVAC program to stop the spread of specific gray fox and coyote rabies variants or "strains" of the rabies virus in Texas (USDA 2001). The program involves 1) the distribution of ORVAC baits; 2) assistance in monitoring rabies; 3) determining the effectiveness of the ORVAC programs through collection and testing of samples from wild animal specimens; and 4) if necessary, the participation in implementing contingency plans that include the localized population reduction of the target species in areas where rabies outbreaks occur beyond ORVAC barriers (USDA 2001).

Oral Rabies Vaccination zones in Texas are delineated based on the most current distribution of rabies cases and the expected direction of disease spread. Vaccination zones are determined in cooperation with the state rabies task force, TDH, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. Baits are distributed over a variety of classes of land ownership, including private, public, tribal, and state and federal lands. As a variety of classes of land ownership are located within the proposed program boundaries, participation by the NPS helps ensure effective coverage and distribution of ORVAC baits and reduces the chance of foci that could serve as sources of rabies reinfection. Figure 1-1 shows the anticipated ORVAC zones of the gray fox and coyote ORVAC program

in Texas. This only represents the anticipated area of need. The actual areas treated with ORVAC baits may include other areas of the state where coyote or gray fox rabies outbreaks occur.

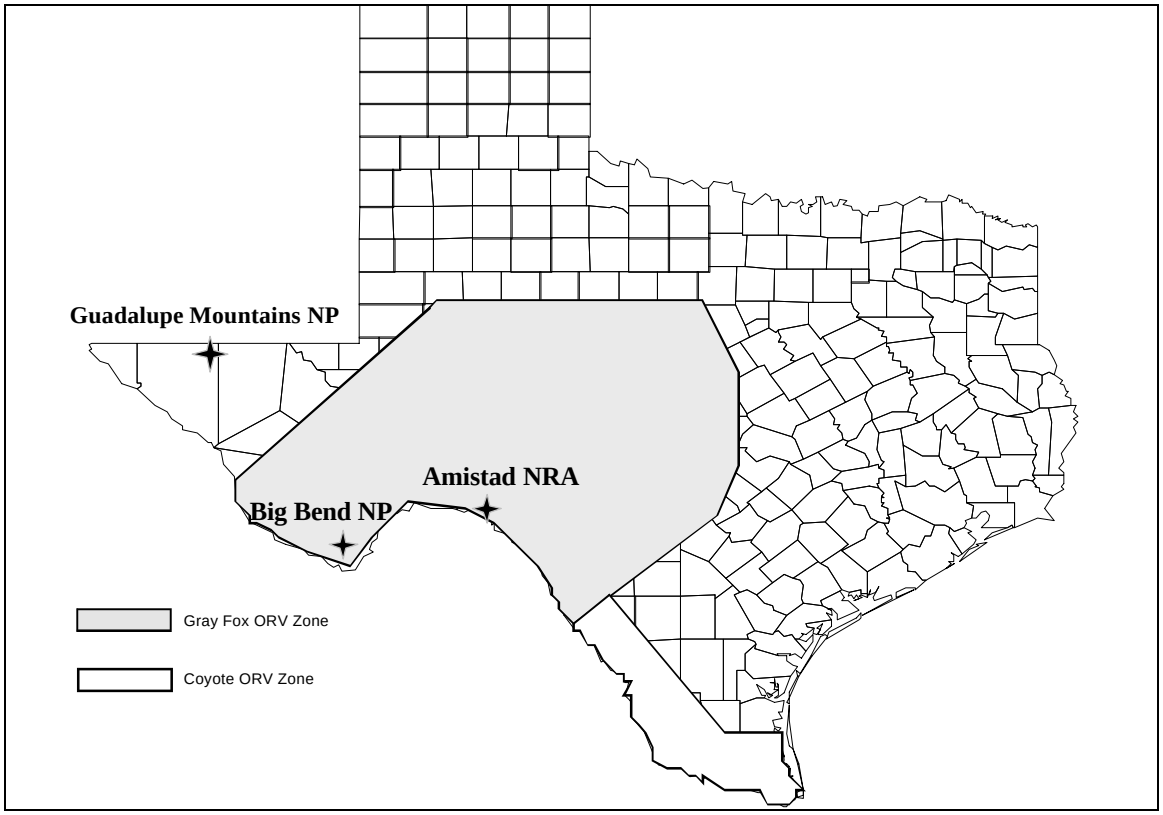

Figure 1-3. The anticipated oral rabies vaccination (ORVAC) zones for the ORVAC program in Texas to stop the spread of gray fox and coyote rabies. Actual areas to be treated with ORVAC baits may include other areas of the state where coyote or gray fox rabies outbreaks occur (USDA 2001).

Since 1995, the Texas ORVAC program has distributed 8.65 million doses of vaccine over 138,600 square miles in South Texas and 8.80 million doses of vaccine over 116,800 square miles in West-Central Texas (TDH 2002). As a result of the ongoing ORVAC program the number of domestic dog/coyote reported rabies cases in South Texas has been reduced from 166 in 1994 to 0 in 2001 and the number of Texas fox reported rabies cases in West-Central Texas has declined from 188 in 1995 to 20 in 2001 (Oertli et al. 2002). To effectively combat coyote and gray fox rabies in Texas, the TDH believes that it will become important to develop a "maintenance strategy" that can prevent a reintroduction of the virus into South Texas, especially along the southern Texas border and a need to continue an aggressive program in West-Central Texas (Oertli et al. 2002).

1.2 PURPOSE OF THE PROPOSED PROGRAM

The proposed program would distribute ORVAC baits at Big Bend National Park, Guadalupe Mountains National Park, and Amistad National Recreation Area to support and cooperate with the state of Texas in their ongoing efforts of eliminating or stopping the forward spread of gray fox rabies in West-Central Texas.

1.3 NEED FOR ACTION

1.3.1 Gray fox rabies in Texas.

Gray fox rabies is defined as a species specific variant of the rabies virus that is adapted to gray foxes. It does not include rabies transmitted to foxes from other variants of the rabies virus (Clark and Wilson 1995). Two geographically distinct reservoirs of the gray fox variant are found in the U.S. One located in west-central Texas and the other in Arizona (Krebs et al. 2001). Modern molecular typing suggests that the remnant of gray fox rabies in Texas is the historical aftermath of an introduction of Old World rabies virus from dogs (Rupprecht, CDC, pers. comm. 2002).

In 1946, an epidemic of fox rabies began in East Texas and spread southwesterly through 1955. During the 1960's fox rabies disappeared from eastern portions of Texas and became localized and prevalent during the 1970's and 80's in West Texas (Clark and Wilson 1995). In 1988, gray fox rabies became epidemic in West Central Texas (Clark and Wilson 1995). From a starting point near Sonora, Texas in Sutton County in 1988, an epidemic of gray fox rabies cases expanded 80 miles northward and 140 miles eastward. This particular strain infected domestic cats and dogs and was readily transmitted to raccoons and to livestock, especially cows and goats (Clark and Wilson 1995). Rabies outbreaks involving domestic animals greatly increase the risk of human exposure which heightened the seriousness of this particular epidemic from a public health standpoint (Clark and Wilson 1995). In 1994, the public health threat created by two expanding epidemics (canine rabies in South Texas and gray fox rabies in West-Central Texas) prompted the Governor of Texas to declare rabies a public health emergency in the state (Clark and Wilson 1995).

1.3.2 Need for a gray fox ORVAC program.

If new rabies strains such as those transmitted by gray foxes are not prevented from spreading to new areas of Texas and the U.S., the health threats and costs associated with rabies are expected to increase substantially as broader geographic areas are affected.

Need to protect human health and safety
People are concerned with potential health threats and costs associated with being exposed to a rabid animal. People are most often exposed through a bite from a wild or domestic animal infected with the disease (CDC 2001a). More than 90% of all reported animal cases occur in wild animals (CDC 2001a). Rabies is a fatal disease in humans unless medically treated with postexposure prophylaxis. Human health care concerns associated with the disease would be expected to increase as the rabies virus infects a much broader geographic area. A more detailed description of the need to protect humans from exposure to the rabies virus is presented in section 1.1.2 of the EA.

Need to protect domestic animals
In the area that stretches west from the leading edge of the current distribution of raccoon rabies (which stretches from Alabama northeastward along the Appalachian Mountains through coastal Maine) to the Rocky Mountains, and north from the distribution of gray fox and coyote rabies in Texas, there are more than 111 million livestock animals, including cattle, horses, mules, swine, goats, and sheep, valued at $42 billion (65 FR 76606-76607, December 7, 2000). In 2001 and 2002, Texas livestock (cattle, calves, sheep, lambs, goats, goat kids, hogs, pigs) was valued at $8.6 billion and $8.5 billion, respectively (USDA-NASS 2002). Also within this area are countless numbers of domestic animals that are kept by people as pets (cats, dogs, rabbits, ferrets, etc). If gray fox rabies were to spread into the above described area, many of these domestic animals would be at risk of being exposed to the virus.

1.4 DESCRIPTION OF THE PROPOSED ACTION

The NPS, in cooperation with the TDH and APHIS-WS, proposes to authorize an ORVAC program at Big Bend National Park (BBNP), Guadalupe Mountains National Park (GMNP), and Amistad National Recreation Area (ANRA) in West-Central Texas where gray fox rabies outbreaks occur or have the potential to occur. Potential areas involved may cover several land types and land uses, including: forests, meadows, wetlands, and rangelands representing diverse wildlife habitats. The program would involve the distribution of ORVAC baits to create zones of vaccinated target species that would then serve as barriers to cease the further advancement of gray fox rabies virus variants. Vaccination zones would be determined

in cooperation with the state rabies task force, TDH, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve use of APHIS-WS federal funds to purchase and distribute ORVAC baits.

The ORVAC that would be used is the V-RG vaccine. V-RG vaccine is approved by USDA, APHIS, VS, Center of Veterinary Biologics for experimental use on gray fox in Texas. The V-RG vaccine would be encased in dog food type baits. The baits weigh approximately 1 ounce and measure 11/4 x 11/4 x 3/4 inches. When an animal finds and ingests the bait, it receives a single dose of the vaccine. Each individual bait would have a warning label advising persons not to handle or disturb the bait along with a toll-free telephone number to call for further information. Individual baits may contain a non-toxic biomarker (e.g., tetracycline, iophenoxic acid) (Johnston et al. 1987, USDA 1991). This biomarker is used to aid in determining whether animals have eaten one or more baits for the purpose of monitoring project effectiveness within and outside the established ORVAC barrier zones. The TX ORVAC program collects wild animals for monitoring purposes throughout the state (USDA 2001). However, the TX ORVAC program has determined that it would not be necessary to collect wild animals for monitoring purposes on BBNP, GMNP, or ANRA. Therefore, no wild animals will be collected at BBNP, GMNP, or ANRA for monitoring purposes. The NPS will use monitoring data collected by the TX ORVAC program on non-NPS lands surrounding the parks to determine if program goals have been met.

On an annual basis, one treatment of ORVAC baits could be distributed by aircraft (fixed-wing airplane or helicopter) and ground placement on BBNP, GMNP, or ANRA. The need to distribute baits on each of the parks would be assessed annually and based on the most current distribution of rabies cases and the expected direction of disease spread. The annual treatment would continue on a reoccurring basis until the goals of the ORVAC program have been met. Baits would be distributed at an average density of 100 baits per square mile during the month of January. Air drops would be typically conducted at about 500 feet above ground level and would only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution. ORVAC baits would not be aerially distributed in areas that are frequently used by a high volume of park visitors (i.e. visitor centers, campgrounds, etc.), as well as over lakes, reservoirs, and large rivers. Aerial distribution of baits would primarily target areas of habitat suitable for the target species. When aerial distribution by fixed-wing or helicopter aircraft is not practical, baits would be distributed by careful hand placement to help to minimize contact by humans, pets and other domestic animals.

The proposed ORVAC program would be conducted in compliance with appropriate federal, state and local laws including National Park Service Management Policies 2001, Director's Orders, other laws, executive orders, and general environmental legislation used to guide management practices carried out on NPS lands.

1.5 AUTHORITIES

Federal Authorities

National Park Service Organic Act - Act of August 25, 1916 (16 U.S.C. 1, 2, 3, and 4) and Management Policies. By enacting the National Park Service Organic Act of 1916 (Organic Act), Congress directed the U.S. Department of the Interior and the National Park Service to manage units "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1). Congress reiterated this mandate in the **Redwood National Park Expansion Act of 1978** by stating that the National Park Service must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1a-1).

Despite these mandates, the Organic Act and its amendments afford the National Park Service latitude when making resource decisions that balance visitor recreation and resource preservation. By these acts Congress "empowered [the National Park Service] with the authority to determine what uses of park

resources are proper and what proportion of the parks resources are available for each use" (*Bicycle Trails Council of Marin v. Babbitt*, 82 F.3d 1445, 1453 (9th Cir. 1996)).

Yet, courts consistently interpreted the Organic Act and its amendments to elevate resource conservation above visitor recreation. *Michigan United Conservation Clubs v. Lujan*, 949 F.2d 202, 206 (6th Cir. 1991) states, "Congress placed specific emphasis on conservation." The *National Rifle Ass'n of America v. Potter*, 628 F. Supp. 903, 909 (D.D.C. 1986) states, "In the Organic Act Congress speaks of but a single purpose, namely, conservation." The NPS *Management Policies* also recognize that resource conservation takes precedence over visitor recreation. The policy dictates "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant" (NPS *Management Policies 2001*, sec. 1.4.3).

Because conservation remains predominant, the National Park Service seeks to avoid or to minimize adverse impacts on park resources and values. Yet, the Park Service has discretion to allow negative impacts when necessary (NPS *Management Policies 2001*, sec. 1.4.3). While some actions and activities cause impacts, the National Park Service cannot allow an adverse impact that constitutes a resource impairment (NPS *Management Policies*, sec. 1.4.3). The Organic Act prohibits actions that permanently impair park resources unless a law directly and specifically allows for the actions (16 USC 1a-1). An action constitutes an impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS *Management Policies*, sec. 1.4.4). To determine impairment, the National Park Service must evaluate "the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts" (NPS *Management Policies*, sec. 1.4.4).

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, the recreational activities appropriate for each unit and for areas within each unit vary as well. An action appropriate in one unit could impair resources in another unit. Thus, this environmental assessment analyzes the context, duration, and intensity of impacts related to an oral rabies vaccination program at Big Bend National Park, Guadalupe Mountains National Recreation Area, and Amistad National Recreation Area, as well as potential for resource impairment, as required by NPS *Director's Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making (DO-12).*

Public Law 89-667 and 100-541. Guadalupe Mountains National Park was authorized by Public Law 89-667, October 15, 1966, "to preserve in public ownership an area in the State of Texas possessing outstanding geological values together with scenic and other natural values of great significance." The park was formally established on September 30, 1972. Public Law 100-541, October, 1988 authorized an additional 10,123 acres to the park.

Public Law 101-628. Amistad National Recreation Area was authorized by Public Law 101-628, November 28, 1990, in order to "1) provide for public outdoor recreation use and enjoyment of the lands and waters associated with the United States portion of the reservoir known as Lake Amistad, located on the boundary between the State of Texas and Mexico, and 2) protect the scenic, scientific, cultural, and other value contributing to the public enjoyment of such lands and waters."

Act of June 20, 1935 (16 U.S.C. 156, 157, 158). Big Bend National Park was authorized in the act of June 20, 1935 "to provide for the establishment of the Big Bend National Park in the State of Texas, and for other purposes." Public Law 96-607, December, 1980, authorized revision of the boundary of the park to include other lands.

Act of March 2, 1931 (7 U.S.C. 426, 426b and 426c). APHIS-WS is authorized to conduct programs to address wildlife-caused disease problems, including the suppression of rabies in wildlife, by the Act of March 2, 1931, as amended.

7 U.S.C. Sec. 147b. This law authorizes the Secretary of Agriculture, in connection with emergencies which threaten any segment of the agricultural production industry of the U.S., to transfer from other

appropriations or funds available to the agencies or corporations of USDA such sums as the Secretary may deem necessary, to be available only in such emergencies for the arrest and eradication of contagious or infectious diseases of animals. It is under this authority that funds from the federal Commodity Credit Corporation have been transferred to APHIS-WS to expend for the continuation and expansion of ORVAC programs in Texas (65 FR 76606-76607, December 7, 2000).

Virus-Serum-Toxin Act (21 U.S.C. 151 et seq.). The oral rabies vaccine (Raboral V-RG®) is licensed for treatment of raccoons and coyotes by the USDA under the Virus-Serum-Toxin Act (VSTA). Animal vaccines shipped in or from the U.S. must be prepared under a USDA license. Animal vaccines may not be imported without a USDA license. Federal regulations implementing the VSTA (9 CFR 103.3) require authorization by APHIS before an experimental biological product can be shipped for the purpose of treating limited numbers of animals as part of an evaluation process. The license for Raboral V-RG® requires that it be restricted for use in State or Federal rabies control programs.

Public Health Service Act. The Centers for Disease Control and Prevention (CDC) located in Atlanta, Georgia, is an agency of the U.S. Department of Health & Human Services. CDC's Mission is to promote health and quality of life by preventing and controlling disease, injury, and disability. CDC is authorized under 42 U.S.C. 241 to render assistance to other appropriate public authorities in the conduct of research, investigations, demonstrations, and studies relating to the causes, diagnosis, treatment, control, and prevention of physical and mental diseases and impairments of man. In addition, under 42 U.S.C. 243(a), the Secretary of Health & Human Services, may assist states and their political subdivisions in the prevention and suppression of communicable diseases.

State Authorities

Texas Department of Health (Texas Administrative Code: Title 25; Part 1; Chapter 169). The Texas Department of Health is authorized to conduct programs to address wildlife caused disease problems, including the suppression of rabies in wildlife.

Texas Parks and Wildlife Department (Texas Administrative Code: Title 31; Part 2; Chapters 51-69). The Texas Parks and Wildlife Department is authorized to manage and regulate the take of native wildlife and fisheries in the state of Texas, including state listed threatened and endangered species.

1.6 OTHER RELEVANT FEDERAL LAWS AND REGULATIONS

National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.). NPS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA is intended to meet the NEPA requirement for the proposed action by clearly communicating the scope of federal involvement and by determining if there are any substantive new issues or alternatives that should be analyzed.

Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.). It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). For actions that "may affect" listed species, NPS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)).

National Historical Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470). The NHPA and its Implementing regulations (36 CFR 800) require federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. Activities described

under the proposed action do not cause major ground disturbance or other adverse impacts on historic resources and are not undertakings as defined by the NHPA. The Texas Historical Commission has reviewed the proposed ORVAC program and has indicated that the proposed program will have no negative effects to historic properties (F.L. Oaks, Texas Historical Commission, December 2, 2002, see Appendix G).

Wilderness Act of 1964 – An Act (Public Law 88-577; 88th Congress, S.4; September 3, 1964). The Wilderness Act allows federally owned lands meetings specific criteria to be designated as "wilderness areas." The act prohibits and restricts certain uses of these designated lands. The act provides special provisions to allow certain activities to take place within designated wilderness areas such as the use of aircraft to control fire, insects and diseases (Sec. 4 (d)).

Clean Air Act of 1970 as amended (42 U.S.C. 7401). The Clean Air Act is a comprehensive Federal law that regulates air emissions from area, stationary, and mobile sources.

1.7 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

NPS PLANS

Management Policies 2001 (USDI 2000). This manual provides guidance on enhancing visitor safety (Section 8.2.5.1) and managing exotic species (Section 4.4.4.), which directly relate to this proposed project. The expanding epidemic of gray fox rabies in West-Central Texas is considered a public health emergency (Clark and Wilson 1995) and is therefore considered under the visitor safety section of the manual. Additionally, this strain of rabies is the historical aftermath of an introduction of Old World rabies virus from dogs (Rupprecht, CDC, pers. comm. 2002) and hence is an exotic species. The proposed project is, therefore, consistent with the *Management Policies 2001* manual. Additionally, NPS personnel reviewed the appropriate plans (i.e., strategic, general management, and resource management plans) for individual park units. There are no conflicts between the proposed action and any existing park plans. The proposed action is consistent with national guidance (Turk, NPS, pers. comm. 2002).

General Management Plan – Big Bend National Park (Master Plan). BBNP's Master Plan provides information concerning the purpose of the park area, its resource value, its relationship to regional environs, the population it will serve and how, the objectives of management, an allocation of land to appropriate uses, concepts of visitor use and interpretation, and an overall plan for its management and development. The Master Plan is the foundation for the preparation of other management documents and action plans.

Strategic Plan – Big Bend National Park/Rio Grande Wild and Scenic River (October 1, 2001 – September 30, 2005). BBNP's Strategic Plan provides the park's mission, purpose, and significance.

Resources Management Plan – Big Bend National Park (March 1996). BBNP's Resources Management Plan provides guidelines for managing the park's cultural and natural resources.

Master Plan - Guadalupe Mountains National Park (1976). The GMNP Master Plan provides information concerning the purpose of the park area, its resource value, its relationship to regional environs, the population it will serve and how, the objectives of management, an allocation of land to appropriate uses, concepts of visitor use and interpretation, and an overall plan for its management and development. The Master Plan is the foundation for the preparation of other management documents and action plans. The existing Master Plan is sorely out of date and was produced at a time when increased development and new transportation corridors were proposed for the infant park. The park is presently preparing a General Management Plan, the document to supercede the Master Plan. It is intended to be the guidance document for a 10-20 year period.

Strategic Plan FY2001-2005 - Guadalupe Mountains National Park (2000). The Strategic Plan represents the best and most realistic projections of the future needs and concerns for GMNP, its employees

and visitors, the natural, cultural and aesthetic resources, and the stakeholders who may never have an opportunity to visit the park. It contains the park mission statement, purpose and significance, and 5-year goals.

Resources Management Plan - Guadalulpe Mountains National Park (1992). The Resources Management Plan identifies park natural and cultural resources and the proposed courses of action to manage them in accordance with the enabling legislation and Master Plan for the park. These actions are identified as either currently operational programs or projects requiring additional funding or staff to initiate or complete. These project statements include management actions such as integrated pest management, wildlife restoration, research needs, natural and historic feature protection, and exotic plant and animal control.

General Management Plan/Development Concept Plan – Amistad National Recreation Area (April 1987). This plan addresses a wide range of concerns such as recreation area land use, resource protection, research needs, visitor activities, interpretation, operations, and development. It also provides a comprehensive list of management proposals and covers numerous legal requirements.

Strategic Plan – Amistad National Recreation Area (October 1, 2001 – September 30, 2005). ANRA's Strategic Plan provides the park's mission statement, long-term goals, a description of how goals will be accomplished, relationship of annual goals to long-term goals, key external factors, program evaluation methodology, and consultation with affected and interested parties.

Resources Management Plan – Amistad National Recreation Area (August 1998). ANRA's Resources Management Plan describes, documents, and prioritizes resource management issues, problems, and actions needed to protect cultural and natural park resources and to meet stated objectives in the years 1998-2002.

NEPA DOCUMENTS
A number of other NEPA documents have been prepared that analyzed the potential environmental effects of ORVAC programs. Pertinent information from those analyses has been incorporated by reference into this EA.

Wildlife Services Programmatic EIS. APHIS-WS has issued a final Environmental Impact Statement (EIS) (USDA 1997j) and Record of Decision on the National APHIS-WS program.

EA and Finding of No Significant Impact – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the United States. This EA (USDA 2001) and Finding of No Significant Impact (FONSI), dated July 30, 2001, and a subsequent FONSI, dated August 5, 2002, analyzed the environmental effects of APHIS-WS involvement in the funding of and participation in ORVAC programs to eliminate or stop the spread of raccoon rabies in a number of eastern states and gray fox and coyote rabies in Texas. APHIS-WS determined the action would not have any significant impact on the quality of the human environment.

EA and Finding of No Significant Impact – Proposed Issuance of a Conditional United States Veterinary Biological Product License to Rhone Merieux, Inc., for Rabies Vaccine, Live Vaccinia Vector. This EA and its FONSI dated April 7, 1995 was prepared by APHIS and concluded there would be no significant impact on the quality of the human environment from the decision to issue the conditional license referred to above (USDA 1995a). The conditional license approved the use of V-RG in raccoon rabies control programs administered under the direction of State or Federal Government Agencies. Mitigative measures required under the decision included public education and notification efforts prior to distributing the baits, and the placement of warning labels on each vaccine-laden bait.

EA and Finding of No Significant Impact – Proposed Field Application of an Experimental Rabies Vaccine, Live Vaccinia Vector, in South Texas. This EA and its FONSI completed in 1995 analyzed the environmental effects of experimental distribution of ORVAC baits containing V-RG to eliminate and stop

the spread of coyote rabies in South Texas (USDA 1995b). APHIS determined the action would not have any significant impact on the quality of the human environment.

EAs and Findings of No Significant Impact on proposed field trials/tests of live experimental vaccinia-vector recombinant rabies vaccine for raccoons. APHIS analyzed the potential environmental impacts of six separate field trials or tests of the recombinant V-RG vaccine in several northeastern states. In EAs and FONSIs covering those actions, (USDA 1991, 1992, 1993, 1994a, 1994b, 1994c), APHIS determined that none of the actions would have any significant impact on the quality of the human environment.

Risk Analyses for ORVAC using the V-RG recombinant virus. Two formal risk analyses on the rabies vaccine -- live vaccinia vector (i.e., the recombinant V-RG vaccine) have been prepared previously by APHIS (USDA undated *a*, USDA undated *b*). Both analyses concluded the risk of adverse animal safety, human safety, or other environmental effects to be low.

1.8 EXECUTIVE ORDER ON ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations requires Federal agencies to analyze disproportionately high and adverse environmental effects of proposed actions on minority and low-income populations. NPS has analyzed the effects of the proposed action and determined that implementation would not have adverse human health or environmental impacts on low-income or minority populations.

1.9 EXECUTIVE ORDER ON PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH AND SAFETY RISKS

Executive Order 13045 was passed to help protect children who may suffer disproportionately from environmental health and safety risks for many reasons. ORVAC activities as proposed in this EA would only involve legally available and approved methods that have been subjected to safety evaluations and testing. The vaccinia virus used as a carrier of the rabies glycoprotein is the same type of virus that was used in smallpox eradication, although more attenuated or weakened (USDA 1991, p. 39). The analysis in this EA supports a conclusion of very low to no risk of adverse effects on children from the ORVAC baiting strategy. Implementation of the proposed action would not increase environmental health or safety risks to children, but would in fact reduce such risks by minimizing the potential for children to contract rabies. Children are particularly at risk from rabies because they are more prone to experiencing "undetected" or "unappreciated" exposures (Huntley et al. *unpublished* 1996) that do not lead to post-exposure vaccine treatments. Therefore, federal involvement in ORVAC programs is consistent with and helps to achieve the goals of EO 13045.

1.10 DECISION TO BE MADE

Based on the scope of this EA, the decisions to be made are:

- Should the NPS approve ORVAC bait distribution at BBNP, GMNP, and ANRA?
- Would the proposed action have significant impacts on the quality of the human environment requiring preparation of an EIS?

1.11 GOALS

The primary goals of the proposed gray fox ORVAC program are:

- to cooperate with the state of Texas in stopping the forward advance of the gray fox strain of rabies in west-central Texas by approving the use of ORVAC to immunize portions of target species populations along the leading edges of the rabies fronts; and

- to cooperate with the state of Texas in reducing the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans in the areas where the ORVAC programs are conducted.

Monitoring
To determine if program goals have been met, the NPS will use monitoring data collected by the TX ORVAC program on non-NPS lands surrounding the parks. This information will allow the NPS and the state of Texas to determine if the goals of the ORVAC program on BBNP, GMNP, and ANRA have been met.

1.12 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

Actions Analyzed/Site Specificity. This EA analyzes the potential environmental effects of the NPS participation in an ORVAC program at BBNP, GMNP, and ANRA. The program would support the TDH efforts of eliminating or stopping the forward spread of gray fox rabies in West-Central Texas.

Period for Which this EA is Valid. This EA will remain valid until NPS determines that new needs for action, new unforeseen significant issues, or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be revised pursuant to NEPA.

1.13 SCOPING PROCESS

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an EA. BBNP, GMNP, and ANRA conducted both internal scoping with appropriate staff from the NPS, APHIS-WS, and TDH; and external scoping with the public and interested and affected groups and agencies. The interdisciplinary internal scoping process defined the purpose and need, identified potential actions to address the need, determined what the likely issues and impact topics would be, and identified the relationship, if any, of the proposed action to other planning efforts at BBNP, GMNP, and ANRA.

Both a press release (see Appendix F) and a notice posted on BBNP, GMNP, and ANRA park web sites were issued on September 25, 2002. In addition scoping notices (see Appendix E) were directly mailed to 267 interested and affected groups and agencies, including potentially affected American Indian tribes. Comments were solicited during external scoping until November 1, 2002. Six comment letters were received during the 38 day scoping period. Comments were received from Carlsbad Caverns National Park; County Commissioner of Val Verde County, Texas; International Boundary and Water Commission – United States and Mexico, Southeastern Cooperative Wildlife Disease Study, a private citizen in Ohio, and a Netherlands based viral vaccine company. Each letter expressed support of the proposed action. Specific concerns and issues identified in the letters included:

- Is the proposed ORVAC program a corrective or preventative program to stop the spread of gray fox rabies at GMNP? (See Sections 1.1.5, 1.4, and 2.2.4)
- How will you know when goals of the proposed program have been met if no animals will be collected in the affected parks for monitoring purposes? (See Sections 1.11 and 1.4)
- How much non-NPS lands around ANRA will be included in the ORVAC treated areas? (See Sections 1.1.5 and 2.3)
- Warning labels on individual baits should be bi-lingual and include Spanish wording for those not fluent in English. (See Section 2.2.5)
- All possible precautions should be taken to avoid distributing ORVAC baits over waters of the Rio Grande River. (See Sections 2.2.3 and 3.3)
- The proposed linear flight paths for ORVAC bait distribution should be adjusted along the Rio Grande to ensure aircraft and ORVAC baits remain in the U.S. (See Section 3.3)

- Aerial bait drops should be coordinated with the appropriate US Border Patrol Sector within the drop areas. (See Section 3.3)
- Why are BBNP, GMNP, and ANRA implementing an ORVAC program? (See Sections 1.1.5, 1.3.1, and 2.2.4)
- Are BBNP, GMNP, and ANRA the only areas being targeted for ORVAC bait distribution, or is this part or a regional program? (See Section 1.1.5)
- How will baits be distributed among the habitat types found in each of the parks? (See Section 2.3)
- Are the treatments along the Mexican border expected to be permanent? (See Section 1.1.5)
- How will the uptake of baits by non-target desert rodents affect the program? (See Section 2.2.6)

No other alternatives were proposed.

2.0 CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.1 ISSUES

From comments received during the scoping period and interactions and input received from those involved with the ORVAC program in Texas the following issues were determined to be germane to the proposed action and were considered in detail in Chapter 4:

- Potential for adverse effects on people that become exposed to the vaccine or the baits.
- Effects of the ORVAC V-RG vaccine on gray foxes.
- Potential for adverse effects on nontarget wildlife species, including threatened or endangered species.
- Potential for adverse effects on pet dogs or other domestic animals that might consume the baits.
- Potential for the recombined V-RG virus to "revert to virulence" and result in a virus that could cause disease in humans or animals.
- Potential for the V-RG virus to recombine with other viruses in the wild to form new viruses that could cause disease in humans or animal
- Potential for aerially dropped baits to strike and injure people or domestic animals.
- Potential effects on NPS wilderness areas
- Potential impacts on visitor use/experience

2.2 OTHER ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

2.2.1 Potential for adverse impacts on wildlife from aircraft overflights.

The concern here is that wildlife species on NPS lands might be disturbed by the aircraft used in ORVAC bait distribution to the point that they are adversely affected.

USDI (1995) reviewed studies on the effects of aircraft overflights on wildlife. The report revealed that a number of studies have documented responses by certain wildlife species that suggest adverse impacts could occur. Few if any studies have proven that aircraft overflights adversely impact populations, although the report stated it is possible to draw the conclusion that impacts to wildlife populations are occurring. It appears that some species will frequently or at least occasionally show adverse responses to even minor/short-term overflight occurrences. In general, it appears that the more serious potential impacts occur when overflights are *chronic*, i.e., they occur daily or more often over long periods of time. Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. ORVAC program aerial bait distribution activities are not chronic, but occur only once per year. They are typically conducted at about 500 feet above ground level and only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution. Additionally, bait drops would not occur during the breeding season for federally listed threatened or endangered species that might be present in the parks. Based on USFWS opinion, the NPS has imposed overflight restrictions on GMNP from March 1 - September 1 and on BBNP from February 1 – July 15 so that sensitive species are not disturbed during breeding and nesting seasons (Armstrong, NPS, pers. comm. 2002 and Skiles, NPS, pers. comm. 2003). Bait drops are normally conducted during the month of January, which should eliminate the possibility of disturbing breeding or nesting sensitive species. Furthermore, aircraft overflights would be of short-term duration, on a local scale, with negligible intensity.

The following are some examples of species or species groups that have been studied with regard to this issue along with a determination of potential impacts from ORVAC aerial overflights:

- Colonial Waterbirds. Kushlan (1979) reported that low level (390 feet followed by a second flight at 200 feet) overflights of 2-3 minutes in duration by a fixed-wing airplane and a helicopter produced no "drastic" disturbance of tree-nesting colonial waterbirds, and, in 90% of the observations, the individual birds either showed no reaction or merely looked up. ORVAC

program overflights typically occur at about 500 feet above ground and would only fly momentarily over any one point on the ground. Thus, it appears that ORVAC program overflights would result in little or no disturbance to colonial waterbirds.

- Greater Snow Geese. Belanger and Bedard (1989, 1990) observed responses of greater snow geese (*Chen caerulescens atlantica*) to man-induced disturbance on a sanctuary area and estimated the energetic cost of such disturbance. They observed that disturbance rates exceeding two per hour reduced goose use of the sanctuary by 50% the following day. They also observed that about 40% of the disturbances caused interruptions in feeding that would require an estimated 32% increase in nighttime feeding to compensate for the energy lost. They concluded that overflights of sanctuary areas should be strictly regulated to avoid adverse impacts. ORVAC program overflights typically occur at about 500 feet above ground and would only fly momentarily over any one point on the ground. Thus, it appears that ORVAC program overflights would result in little or no disturbance to snow geese or other waterfowl species.

- Raptors. Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period. Their results also showed similar nesting success between hawks subjected to such overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but showed that ferruginous hawks (*Buteo regalis*) are sensitive to certain types of ground-based human disturbance to the point that reproductive success may be adversely affected. However, military jets that flew low over the study area during training exercises did not appear to bother the hawks, and neither were they alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). White and Sherrod (1973) suggested that disturbance of raptors by aerial surveys with helicopters may be less than that caused by approaching nests on foot. Ellis (1981) reported that 5 species of hawks, 2 falcons, and golden eagles were "incredibly tolerant" of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and never limiting to productivity. These studies indicate that overflights by ORVAC program aircraft should have no significant adverse impacts on raptor populations by affecting nesting success.

Occasional overflights [i.e., radio telemetry, GIS mapping, low-level flight by light planes over buried petroleum pipeline corridors and buried fiber-optic communications cables to check for leaks or disturbances (twice per day at GMNP), and military training routes by fighter jets, helicopters, and/or transport ships (approximately 4-10 times per month at GMNP)] may occur over park units (Armstrong, NPS, pers. comm. 2002). Overflights for the purposes of ORVAC bait distribution activities would only occur once per year and aircraft will only fly momentarily over any one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait distribution. The potential impact would be of short-term duration, on a local scale, with negligible intensity and should not add appreciably to the frequency of overflights. The addition of one more overflight per year for ORVAC bait distribution should not constitute a substantive increase in any effects that might occur as a result of overflights. Therefore, cumulative impacts from the combination of ORVAC bait distribution overflights and other park unit overflights should be negligible. Thus, the short-term duration, infrequency, and negligible intensity of flights over any given area, in addition to the tolerance of wildlife of such activity, would have a negligible adverse environmental impact on wildlife as a result of ORVAC program overflights.

2.2.2 Potential human health impacts resulting from the human consumption of a vaccinated wild animal.

The issue expressed here is the potential to develop a vaccinia infection from eating a vaccinated animal that has eaten one or more ORVAC baits. Dr. Carolin Schumacher of Merial, Inc. was consulted to obtain information on this issue. Mahnel (1987) reported results of experiments to determine the stability of poxviruses (which include vaccinia used in the V-RG vaccine). "Naked" vaccinia (i.e., vaccinia found outside of host cells) will be inactivated within minutes by heat above 133 degrees Fahrenheit, by ultra-

violet irradiation (sunlight), or by exposure to acid with a pH of 3 or less[2] (e.g., similar to the acid environment found in the stomach of animals). In contrast, however, poxviruses can be relatively stable for years in dry dust or in dried lesion crusts.

The vaccinia from V-RG would generally only bind to animal tissues in the mucous membrane of the oral cavity, pharynx and oesophagus since V-RG does not have the tendency to spread throughout the animal. Those particular tissues are rarely consumed by humans, but if they were, they would most likely be cooked which would kill the virus. Also, concentrations of vaccinia in those tissues should be low because mucosa is not considered a tissue where the virus tends to accumulate (Schumacher, Merial, Inc., pers. comm. 2001 *in* USDA 2001).

Although cell-bound vaccinia is generally more resistant than free virus, humidity and cellular enzyme activity in the tissues as well as bacterial decomposition (e.g., in the gut of ruminants), normally results in inactivation of the virus. In the environment, inactivation of pox viruses is accelerated by temperature changes (Schumacher, Merial, Inc., pers. comm. 2001 *in* USDA 2001).

The above information suggests that possible sources of contamination with vaccinia would be V-RG dried onto the fur of an animal, ingested virus in the stomach, or cell-bound virus in mucous membranes. However, with the combined activity of sunlight and ultraviolet light, humidity, stomach pH and/or bacteria/enzymes, temperature fluctuations, and cooking heat, the risk to human health should be negligible, especially when taking into consideration the attenuated or weakened condition of the vaccinia in the V-RG vaccine. Therefore, the potential for adverse health effects from consuming animals that have eaten ORVAC baits should be low. Additionally, hunting is not permitted in BBNP or GMNP, thus people would not be expected to consume any animals that eat ORVAC baits distributed at these park units.

2.2.3 Potential impacts on water resources

A concern has been expressed regarding the potential impacts of unconsumed V-RG vaccine and baits adversely impacting ground and surface water resources through direct and indirect exposure. Those baits that are not consumed may remain in the environment for several months after placement dependent upon environmental conditions (precipitation, temperature, etc.) and the physical condition of the baits. Potential impacts to water resources are greatly reduced by the limited number of baits that are dropped in a specific area, the biodegradability of the vaccine liquid and baits, the high consumption rate of ORVAC baits by animal species, the safety and efficacy of the vaccine, and the SOPs that are used when dropping baits near a large water source. This conclusion is based upon:

- The possibility of a large quantity of ORVAC baits being exposed to a site specific water resource is extremely low due to the bait distribution densities used by the program. Under the proposed program ORVAC baits would be distributed from aircraft at an average density of 100 per square mile.

- The baits are non-toxic. The baits used for the gray fox ORVAC program are small blocks of dog food that are held together with a polymer binding agent and are considered to be “food grade” materials. Therefore the unconsumed bait material would biodegrade when exposed to the environment causing little to no effect on water resources.

- The ORVAC baits are readily taken up and consumed by wildlife species thereby limiting long term exposure to the environment. The likelihood of a bait being consumed is dependent upon several factors including animal population densities (target and non-target species), bait preference, and the availability of alternative food sources. In field tests conducted in the U.S., the majority of ORVAC baits have been consumed within the first 7 to 14 days after placement, with reports of up to 100% of the baits being consumed within a 7 day period (Farry et al. 1998b, Hable

[2] pH is the measure of acidity or alkalinity of a solution with numbers below 7 representing a progressively more acidic solution. A pH of 3 is highly acidic.

et al. 1992, Hadidian et al. 1989, Hanlon et al. 1989, Linhart et al. 1994, Steelman et al. 2000; USDA 1995a).

- The V-RG virus biodegrades when exposed to the environment. The V-RG virus that is not consumed by the target species or other vertebrates will become inactivated over a relatively short period of time. Persistence and stability of the V-RG virus outside of an organism is highly dependent on ambient temperature and local environmental conditions; the higher the temperature the quicker the virus will become inactive (USDA 1992; USDA 1995a). For example at temperatures between 68 and 100 degrees Fahrenheit the liquid vaccine potency remains stable for approximately 14 to 7 days, respectively, in the un-punctured sachet or inside the bait. In situations where the bait and sachet are damaged inactivation of the V-RG virus will occur more rapidly. A more detailed discussion of the development of ORVAC baits can be found in Chapter 1.

- Program SOPs limit the possibility of ORVAC baits being directly dropped into large water sources such as rivers, lakes, and reservoirs. When the aircraft approaches a large body of water the bait dropping equipment is shut off approximately ¼ mile from the water source to reduce the possibility of ORVAC baits falling into the water. Nevertheless, due to changing environmental conditions and the limited possibility of human error when operating the bait dropping equipment there is the possibility that baits may inadvertently be dropped into a body of water. Exposure of the V-RG vaccine into a water source from an intact bait and sachet is highly unlikely. The vaccine is enclosed in a sealed sachet thereby limiting the possibility of the vaccine liquid being directly released into a water source. Even if the vaccine was released into a water source through a damaged or punctured sachet, it is highly unlikely that the vaccine will cause any adverse affects since the vaccine liquid is biodegradable and nontoxic (USDA 1991, USDA *undated*).

The above information indicates that V-RG vaccine and baits pose no threat to groundwater or surface water through direct or indirect means.

2.2.4 The affected area described in the EA includes NPS lands that have not been identified as having a rabid fox problem.

The affected area of the EA includes NPS lands that have or have the potential for a gray fox rabies outbreak to occur. ORVAC baits are distributed based upon vaccination zones. These vaccination zones are determined in cooperation with the state rabies task force, TDH, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. Vaccination zones are delineated based on the most current distribution of rabies cases and the expected direction of disease spread. Therefore some, all, or none of the NPS lands identified in this EA may be involved in an ORVAC bait distribution program on an annual basis. Figure 1-3 in Chapter 1 shows the current anticipated ORVAC zone based upon recent outbreaks of the virus. The three NPS properties included in this EA were chosen since they have the greatest possibility of being involved in the State's overall efforts of stopping the forward spread of the rabies virus in TX.

2.2.5 Warning labels on individual baits should be bi-lingual and include Spanish wording for those not fluent in English.

Each individual bait has a warning label advising persons not to handle or disturb the bait along with a toll-free telephone number to call for further information. This warning label is written in English. Due to the limited surface area of the baits (11/4 x 11/4 x 3/4 inches) it would not be possible for Spanish wording to be included on the warning label. To be able to accomplish this task, the text size of the warning label would be so small that it would be illegible. To accommodate Spanish speaking individuals the toll-free number provides the caller with an opportunity to speak with someone fluent in Spanish. This should allow those persons not fluent in English the opportunity to obtain information on the ORVAC bait they have encountered.

2.2.6 Effects of non-target species consumption of ORVAC baits on program effectiveness.

Consumption of ORVAC baits by non-target species is not expected to impact program effectiveness. As described in section 1.1.3, baits are developed to attract target species. The use of target preferred baits increase the likelihood of the target species consuming the baits prior to the discovery of baits by non-target species. Furthermore, bait distribution densities are developed to compensate for the uptake of baits by non-target species. Baits are distributed at densities that allow gray fox the opportunity to come in contact with intact baits. It has been determined based upon the success of ORVAC bait drops for gray fox by the TX ORVAC programs in other parts of the state, with similar wildlife species composition as those found in the parks, that the distribution of 100 baits per square mile would be sufficient to maintain program effectiveness.

2.2.7 Potential impacts to Indian trust resources.

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by USDI agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources in these units. The lands comprising the units are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, the Indian Trust Resources issue was dismissed as an impact topic.

Copies of this environmental assessment will be forwarded to each tribe traditionally associated with each park unit's lands for review and comment. If the tribes subsequently identify the presence of ethnographic resources, appropriate mitigation measures would be undertaken if necessary in consultation with the tribes. The location of ethnographic sites would not be made public. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during the proposed program, provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC 3001) of 1990 would be followed. Because there are no known ethnographic resources within the project area, ethnographic resources issues were dismissed as an impact topic. Also, since the ORVAC bait distribution does not involve any ground disturbance, there is little or no potential for disturbance of ethnographic resources.

2.2.8 Potential for adverse impacts on lightscape.

The NPS strives to preserve the natural ambient landscapes, which are natural resources and values that exist in the absence of human-caused light. Recognizing the roles that light and dark periods play in natural resource processes and the evolution of species, the NPS seeks to protect natural darkness and other components of the natural lightscape in parks. (NPS policy for this topic is found in *Management Policies 2001* (USDI 2000), 4.10, Lightscape Management.)

The concern may be that the lightscape conditions in a national park environment might be adversely affected by aircraft overflights during ORVAC bait distribution. Aerial ORVAC bait distribution activities would only occur once per year and aircraft would only fly momentarily over any one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait distribution. The potential impact would be of only momentary duration, on a local scale, with negligible intensity. Therefore, this issue was dismissed as an impact as it will have no chronic effect on lightscape (see Section 2.2.1 for more information).

2.2.9 Potential for adverse impacts on soundscape.

An important part of the National Park Service mission is preservation of natural soundscapes associated with national park units. The natural ambient soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive

and can be transmitted through air, water, or solid materials. (NPS policy for this topic is found in DO-47, *Sound Preservation and Noise Management* and *Management Policies 2001* (USDI 2000), 4.9, Soundscape Management.)

The issue expressed here is that the natural soundscape of national park units may be adversely affected by aircraft overflights during ORVAC bait distribution activities. Aerial ORVAC bait distribution activities would only occur once per year and aircraft would only fly momentarily over any one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait distribution. Overflights are also conducted at a minimum of 500 feet above ground level. Additionally, the types of aircraft used in bait distribution, the Twin Otter and Beechcraft King Air, meet all Federal Aviation Regulation (FAR) requirements regarding noise limits (FAR Part 36, Appendix F). The potential impact would be of extremely short-term duration, on a local scale, with negligible intensity. Therefore, this issue was dismissed as an impact as the ORVAC bait distribution activities will have no chronic effect on soundscape (see Section 2.2.1 for more information).

2.3 AFFECTED ENVIRONMENT

This section presents some descriptive information on the environment of the areas that would be affected by the proposed action. Other descriptive aspects of the affected environment are included in Chapter 4 in the analysis of effects which is based on the environmental and other types of issues identified in section 2.1.

"Major Habitat Types" as described by Ricketts et al. (1999) that encompass the state and that would be affected by ORVAC programs under the proposed action are: Temperate Grasslands/Savannah/Shrub and Xeric Shrublands/Deserts. As described by Bailey (1995) the ecoregions for the affected area range from dry desert to grassland-shrub communities including the following two provinces in the "Dry Domain" series:

- Southwest Plateau and Plains Dry Steppe and Shrub Province – generally flat to rolling plains and plateaus with elevations ranging from sea level to 6,500 ft.; semiarid climate; long hot summers and short mild winters; native vegetation characterized by arid grasslands in which shrubs and low trees grow singly or in bunches; dominant grass species include blue grama, buffalo grass, with mesquite, oak, and juniper typically the dominant shrub and tree species.

- Chihuahuan Desert Province – mostly desert with undulating plains with elevations near 4,000 ft.; long hot summers and short winters; native vegetation mostly dominated by thorny shrubs, in many places associated with short grass such as grama; shrubs and trees include mesquite, creosote bush, yucca, and occasional scattered juniper and pinyon.

2.3.1 Big Bend National Park

Big Bend National Park was authorized on June 20, 1935 and established on June 12, 1944. The park was designated as a U.S. Biosphere Reserve in 1976. The purpose of the park is to:

- preserve and protect all natural and significant cultural resources and values
- provide recreational opportunities that are compatible with the protection and appreciation of park resources for diverse groups
- provide educational opportunities to foster understanding and appreciation of the natural and human history of the region

Big Bend National Park is located in Brewster County in southwest Texas on the U.S.-Mexico border. This region is considered one of the most sparsely populated areas in the U.S. The park encompasses more than 800,000acres of desert, mountain, and river habitats including the Rio Grande River at the park's southern boundary. The park has national significance as the largest protected area of Chihuahua Desert topography and ecology in the U.S. The park is also part of one of the largest transboundary protected areas in North America (USDI 2001b).

The park exhibits seasonal climatic changes with dry, hot late spring and early summer days exceeding 100 degrees Fahrenheit in the lower evaluations. Winters are normally mild, with sub-freezing temperatures occasionally occurring. The altitude in the park ranges from approximately 1,800 feet along the Rio Grande River to 7,800 feet in the Chisos Mountains (USDI 2001b).

Cultural resources in the park range from the Paleo-Indian period 10,500 years ago through the historic period represented by Native America groups, such as the Chisos, Mescalero Apache, and Comanche. Moe recently, Spanish, Mexican and American settlers farmed, ranched, and mined in the area (USDI 200b1).

There are over 1200 identified species of plants (including approximately 60 cacti species), 56 species of reptiles, 11 species of amphibians, 40 species of fish, 450 species of birds, 75 species of mammals, and 3600 species of insects (USDI 2001b).

Visitation to the park has averaged 350,000 in recent years (USDI 2001b). Recreational opportunities at the park include backpacking, bird watching, camping, hiking, mountain biking, horseback riding, water rafting, canoeing, kayaking, nature walks, and wildlife viewing.

2.3.2 Guadalupe Mountains National Park

Guadalupe Mountains National Park was authorized by Public Law 89-667, October 15, 1966, "to preserve in public ownership an area in the State of Texas possessing outstanding geological values together with scenic and other natural values of great significance." The park was formally established on September 30, 1972.

The park consists of 86,416 acres of Chihuahuan Desert Plains, Canyons and uplifted Permian Age Reef located in Culberson and Hudspeth counties, near Salt Flat, TX between El Paso, TX and Carlsbad, NM. Three major biotic regions come together here: the Chihuahuan Desert, Rocky Mountains and Great Plains. Elevations range from 3650 feet to 8749 feet. There are over 900 identified species of plants, 56 species of reptiles and amphibians, over 300 species of birds, 61 species of mammals, 32 known caves, 29 historic structures and more than 370 archeological sites. The park includes 46,850 acres of designated wilderness.

The Guadalupe Mountains are nationally significant because of a combination of outstanding geologic, scientific, and scenic resources, including cultural and natural features unique to the American Southwest. The geology of the Guadalupes is internationally known. The park preserves an important portion of the Capitan Reef, one of the most extensive and significant non-coral fossil reefs in the world. This limestone reef formed in the seas of the Permian Age (250-280 million years ago) and was then uplifted to form a huge V-shaped plateau. The reef is important in tracing the origins of petroleum, potash, sulfur, gypsum, dolomite, and limestone.

In Fiscal Year 2001 (October 2000-September 2001), there were 208,098 recreational park visits recorded for GMNP. Recreational opportunities at the park include backpacking, bird watching, camping, hiking, horseback riding, nature walks, wilderness area, and wildlife viewing.

2.3.3 Amistad National Recreation Area

Amistad National Recreation Area was administered under cooperative agreement with the International Boundary and Water Commission November 11, 1965, authorized as a National Recreation Area by Public Law 101-628 on November 28, 1990, and designated on November 28, 2002. The law creating Amistad ANRA mandated the NPS to:

- provide for public outdoor recreation use and enjoyment of the lands and waters associated with the United States portion of the reservoir known as Lake Amistad, located on the boundary between the State of Texas and Mexico.
- protect the scenic, scientific, cultural, and other value contributing to the public enjoyment of such lands and waters.

The recreation area consists of 57,292 acres, most of which are underwater, located in an arid desert climate on the U.S.-Mexico border in Val Verde County, west of Del Rio, TX. Located within the boundaries of the recreation area is Lake Amistad. Lake Amistad is an International reservoir and recreation area containing 890 miles of shoreline, of which 540 are located within the U.S. The reservoir, at the confluence of the Rio Grande, Devils, and Pecos rivers was created by the Amistad Dam in 1969 and consists of 67,000 acres of water. The area is rich in archeology and rock art, and also contains a wide variety of plant and animal life including reptiles, amphibians, birds, fish, and mammals (USDI 2001a).

Approximately 1.2 million people visit ANRA each year for their experience, enjoyment, understanding, and appreciation (USDI 2001a). Recreational opportunities at the ANRA include boating, fishing, hunting, swimming, scuba diving, water skiing picnicking, bird watching, camping, hiking, nature walks, and wildlife viewing.

3.0 CHAPTER 3: ALTERNATIVES

3.1 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

3.1.1 Alternative 1. Authorize an ORVAC Program - Proposed action (*this is the preferred alternative*).

Under this alternative, NPS would authorize the inclusion of BBNP, GMNP, and ANRA in its ongoing ORVAC program in West-Central Texas to create zones of vaccinated target species that would then serve as barriers to eliminate and/or cease the further advancement of gray fox rabies virus variants. Vaccination zones would be determined in cooperation with the state rabies task force, TDH, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve use of APHIS-WS federal funds to purchase and distribute ORVAC baits. On an annual basis, one treatment of ORVAC baits would be distributed by aircraft (fixed-wing airplane or helicopter) and ground placement on BBNP, GMNP, or ANRA. The need to distribute baits on each of the parks would be accessed annually and based on the most current distribution of rabies cases and the expected direction of disease spread. The treatment would continue on a reoccurring basis until the goals of the ORVAC program have been met. A more detailed description of the proposed action can be found in section 1.4 of this EA.

3.1.2 Alternative 2. No action.

This alternative would preclude the NPS from any involvement with an ORVAC program at BBNP, GMNP, or ANRA. The "No Action" alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a basis for comparison with the other alternatives.

3.2 ALTERNATIVES CONSIDERED BUT NOT IN DETAIL, WITH RATIONALE

3.2.1 An ORVAC program with animal specimen collections for monitoring purposes.

Under this alternative, an ORVAC program would be implemented similar to the proposed action but would also include the collection of wild animal specimens from NPS lands for monitoring and project evaluation purposes through the use of a variety of live capture or lethal methods including shooting, leghold traps, cage traps, foot snares and wire cable neck snares (USDA 2001). The TX ORVAC program collects wild animals for monitoring purposes in other areas of the state (USDA 2001). However, the TX ORVAC program has determined that it would not be necessary to collect wild animals for monitoring purposes on BBNP, GMNP, or ANRA at this time or within the foreseeable future. For this reason this alternative was not considered further.

3.2.2 Live-capture-vaccinate-release programs.

This alternative would involve the live capture of gray fox followed by administration of rabies vaccines by injection and release back into the wild. This strategy has been used in certain localized areas for reducing the incidence and spread of rabies in raccoons (Brown and Rupprecht 1990; Rosatte et al. 1990; Rosatte et al. 1992; Rosatte et al. 1993) and skunks (Rosatte et al. 1990; Rosatte et al. 1992; Rosatte et al. 1993). The method has not been attempted for vaccination of foxes because they are much more difficult to capture in cage traps and it is difficult to live capture and release a high enough proportion of the population with other traps such as leghold traps and snares (Rosatte et al. 1993; MacInnes, Ontario Ministry of Natural Resources pers. comm. 2001 *in* USDA 2001; personal observation of APHIS-WS personnel *in* USDA 2001). Currently, no vaccine is specifically licensed for this type of use (CDC 2000). However, certain injectable vaccines may be used "off-label" under the direction of veterinarians to vaccinate wild animal species in certain situations (Mitzel, APHIS-Veterinary Services, pers. comm. 2001 *in* USDA 2001). For these reasons this alternative was not considered further.

3.2.3 Depopulation of gray fox.

This alternative would result in the lethal removal of gray foxes throughout the zones where outbreaks of this variant of rabies virus is occurring or is expected to occur. The goal would be to achieve elimination of the gray fox rabies strain by severely suppressing populations of gray foxes over broad areas so this specific variant of rabies could not be transmitted to other susceptible members of the same species. This could theoretically stop the forward advance of the disease and potentially result in elimination of the gray fox rabies variants since infected animals would die from rabies before they could transmit it to other members of the same species.

Population reduction is often suggested as a method to control rabies in wildlife populations since the disease is density dependent (Debbie 1991). Bounty incentives, regulated hunting and trapping, ingestible poisons, and fumigation of dens have all been employed to control populations with varying levels of success. MacInnes (1998) reviewed some of the past efforts to control rabies with population reduction of carrier species and concluded that, with a couple of exceptions, most such efforts have failed. In some of the situations, it could not be determined whether an observed decline or disappearance of rabies cases was attributable to population control work or to the disease simply reaching some unexplainable geographical limitation or just dying out on its own (MacInnes 1998). Also, population control as a strategy can be questionable because the leading edges of rabies outbreaks do not necessarily coincide with the edge of the range of the principal "vectors" (e.g., raccoons, gray foxes, and coyotes), nor are they always necessarily related to the population density of such vectors (MacInnes 1998).

The greatest difficulty with population reduction as a strategy for reducing or eliminating rabies is that a high level of effort must be maintained almost indefinitely (MacInnes 1998). Population suppression can be a challenge to maintain in many situations due to immigration (of other members of the same species from surrounding populations) and compensatory reproduction (i.e., larger litters and greater percentages of females breeding following population reduction) (Clark and Fritzell 1992, Connolly and Longhurst 1975). These two factors could result in local populations recovering to their previous population level in a relatively short period of time, thus requiring a sustained and frequent suppression effort to maintain populations at the desired levels.

For these reasons, and because depopulation of the gray fox species would be considered inconsistent with the NPS mission, this alternative was not considered further.

3.2.4 Employ other types of ORVAC instead of the genetically engineered V-RG vaccine.

Under this alternative, the NPS would use or authorize the use of a "modified-live-virus" (i.e., "attenuated" or weakened strains that have been shown to have little chance of causing rabies in treated animals) or perhaps "killed-virus" (i.e., "inactivated" virus) oral vaccines instead of the V-RG vaccine. Modified-live-virus vaccines include those that have been used in the past to vaccinate domestic animals by injection in the U.S. Oral baits that employed several strains of these types of virus vaccines have been investigated and used in Europe to stop the spread of rabies in red foxes (Flamand et al. 1993, Artois et al. 1993, Artois et al. 1997). They have also been tested in red foxes in Canada (Lawson et al. 1989, Lawson et al. 1997), and in red foxes and raccoons in the U.S. (Rupprecht et al. 1989, Rupprecht et al. 1992c).

The primary concern with attenuated or "live" virus vaccines (e.g., SAD and ERA) is that they can sometimes cause rabies (Flamand et al. 1993, Pastoret et al. 1992). Flamand et al. (1993) reported that one strain used widely in oral baits in Europe to vaccinate wild red foxes in the 1970s could cause rabies in rodents when injected and that the ability to cause rabies in nontarget animals by other modes (i.e., oral administration) could not be ruled out. Previously used attenuated strains are also "heat sensitive" which can limit their use in warmer seasons or climates (Pastoret et al. 1992). These types of safety concerns with attenuated rabies virus vaccines have been sufficient to prevent their approval for use in the U.S. (Rupprecht et al. 1992c).

Inactivated or "killed" virus rabies vaccines are safer than "live" vaccines in that they cannot cause rabies. This type of vaccine was found to be less effective in causing immunity when delivered into the intestinal

tract in foxes (only 30% effective in test animals) and took 2 doses to cause immunity in the foxes that were successfully immunized (Lawson et al. 1989). Also, the amounts of virus particles that would have to be ingested in oral baits by wild carnivores to effectively vaccinate them would be 100 to 1000 times the amount of the live-attenuated virus particles required (Rupprecht et al. 1992c). To manufacture vaccines with these amounts would probably be cost-prohibitive (Rupprecht et al. 1992c).

Currently, Raboral V-RG is the only vaccine licensed for use in raccoons and is approved for experimental use in wild gray foxes and coyotes in the U.S. (CDC 2000). For all of the above reasons, this alternative was not considered further.

3.3 MITIGATION IN STANDARD OPERATING PROCEDURES FOR RABIES ORVAC PROGRAMS

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action.

A number of key mitigating measures are currently part of the standard operating procedures of state-operated ORVAC programs and would be used as part of the ORVAC program on NPS lands. These include:

- Public information and education actions and media announcements to inform the public about ORVAC bait distribution activities before they occur.

- The appropriate government authorities/officials would be notified prior to distributing ORVAC baits along the US-Mexico border.

- Toll-free telephone numbers advertised in the media and on web sites for people to call for answers to questions.

- In the unlikely event that an adverse vaccinia virus exposure in humans, the CDC can make vaccinia immune globulin available to a state on a case-by-case basis to provide a level of additional assurance that such a reaction would be successfully treated.

- Training of bait distribution navigators to avoid dropping baits on people, structures, and large bodies of water (lakes, reservoirs, rivers). During aerial bait drop operations, the bait dispensing equipment is temporarily turned off over large bodies of water, human dwellings, and when people are observed below.

- ORVAC baits would not be distributed by aircraft within ½ mile of the Rio Grande River to reduce the potential of baits entering the river. This will also assure that aircraft do not enter into Mexican airspace and that ORVAC baits are not inadvertently distributed in Mexico.

- Adherence of aircraft to air safety standards.

- Training of personnel in hand distribution of baits to avoid properties with greater risk of human or pet encounters with baits.

- Labels are affixed to each ORVAC bait instructing persons not to disturb or handle them and contain a toll-free telephone number to call for further information and guidance in the event of accidental exposure to the vaccine.

- The toll-free number provided on each bait will allow the caller an opportunity to speak with someone fluent in English or Spanish.

3.4 ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is determined by applying the criteria suggested in Section 101 of the National Environmental Policy Act which states that "…it is the continuing responsibility of the federal government to…(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice; (5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

Alternative 1, the Proposed Action, is the environmentally preferred alternative. Alternative 1 is believed to be the least environmentally intrusive alternative available for achieving the goals of eliminating and stopping the forward advance of the gray fox strain of rabies in west-central Texas and reducing the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans. Alternative 1 surpasses the other alternative (no action) by recognizing the range of national environmental policy goals as stated in Section 101 of the National Environmental Policy Act. Alternative 1 integrates "…safe, healthful….surroundings" with resource protection.

Table 3-1. Comparative Summary of Environmental Impacts

Issue	Expected Impacts by Alternative	
	Alternative 1. Authorize an ORVAC Program - Proposed action (*this is the preferred alternative*).	**Alternative 2. No action.**
Potential for adverse effects on people that become exposed to the vaccine or the baits.	Negligible adverse impacts from humans being exposed to baits and vaccine. Reduced threat of human exposure to the rabies virus.	No impact from being exposed to baits or vaccine. Potential moderate, adverse impacts from risk of human exposure to rabies.
Effects of the ORVAC V-RG vaccine on gray foxes.	No adverse impacts. Beneficial impact from immunizing gray foxes against rabies.	No impact from being exposed to bait or vaccine. Potential moderate, adverse impacts from continued exposure to and possibility of acquiring rabies.
Potential for adverse effects on nontarget wildlife species, including threatened or endangered species.	No adverse impacts. Potential minor beneficial impact by possibly immunizing wildlife species against rabies.	No impact from being exposed to bait or vaccine. Potential moderate, adverse impacts from continued exposure to and possibility of acquiring rabies.
Potential for adverse effects on pet dogs or other domestic animals that might consume the baits.	No adverse impacts. Potential minor beneficial impact by possibly immunizing domestic animals against rabies.	No impact from exposure to baits or vaccine. Potential moderate, adverse impacts from continued exposure to and possibility of acquiring rabies.
Potential for the recombined V-RG virus to "revert to virulence" and result in a virus that could cause disease in humans or animals.	Negligible risk of adverse impacts.	No impact.
Potential for the V-RG virus to recombine with other viruses in the wild to form new viruses that could cause disease in humans or animal	Negligible risk of adverse impacts.	No impact.
Potential for aerially dropped baits to strike and injure people or domestic animals.	Negligible risk of adverse impacts.	No impact.
Potential effects on NPS wilderness areas	Negligible adverse impacts.	No impact.
Potential impacts on visitor use/experience	Negligible impact from distribution of ORVAC baits. Beneficial impact by reducing the threat of being exposed to a rabid animal.	No impact from distribution of ORVAC baits. Potential moderate, adverse impacts from threat of being exposed to a rabid animal.

Table 3-2. Comparative Summary of Alternatives and Extent to which Each Alternative Meets the Project Objectives.

Alternative 1. Authorize an ORVAC Program – Proposed Action *(this is the preferred alternative)*.	**Alternative 2. No Action.**
This alternative would involve NPS participation in an ORVAC program at BBNP, GMNP, and ANRA to create zones of vaccinated target species that would then serve as barriers to eliminate and/or cease the further advancement of gray fox rabies virus variants. Vaccination zones would be determined in cooperation with the state rabies task force, TDH, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve the use of APHIS-WS federal funds to purchase and distribute ORVAC baits. On an annual basis, one treatment of ORVAC baits could be distributed by aircraft and ground placement on BBNP, GMNP, or ANRA. The need to distribute baits on each of the parks would be accessed annually and based on the most current distribution of rabies cases and the expected direction of disease spread. The treatment would continue on a reoccurring basis until the goals of the ORVAC program have been met.	This alternative would preclude the NPS from any involvement with an ORVAC program at BBNP, GMNP, or ANRA.
Meets Project Objectives? Yes. The NPS would assist the state of Texas in stopping the forward advance of the gray fox strain of rabies in west-central Texas by immunizing portions of target species populations along the leading edges of the rabies fronts, within BBNP, GMNP, and ANRA. The NPS would assist the state of Texas in reducing the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans in the areas where the ORVAC programs are conducted (i.e., BBNP, GMNP, and ANRA).	**Meets Project Objectives?** No. The NPS would not assist the state of Texas in stopping the forward advance of the gray fox strain of rabies in west-central Texas. The NPS would not assist the state of Texas in reducing the incidence of rabies cases in wildlife and domestic animals and rabies exposures to humans.

4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Methodology for Assessing Impacts

This section analyzes potential environmental consequences using Alternative 2 (the no action) as the baseline for comparison with the other alternatives to determine if the real or potential impacts are greater, lesser or the same. Table 3-1 summarizes a comparison of the issues and impacts to each alternative.

Potential impacts are described in terms of context (are the effects site-specific, local, or even regional?), duration (short- or long-term?), and intensity (negligible, minor, moderate, or major?). The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible**-the impact is at the lowest levels of detection
- **Minor**-the impact is slight, but detectable
- **Moderate**-the impact is readily apparent
- **Major**-the impact is a severe or adverse impact or of exceptional benefit

In addition to determining the environmental consequences of the preferred and other alternatives, National Park Service policy (*Management Policies, 2001*) requires analysis of potential effects to determine whether or not actions would impair park resources.

The fundamental purpose of the national park system, established by the Organic Act of 1916 and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. An impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park.

Cumulative Impacts. The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and proposed action alternatives.

Cumulative impacts were determined by combining the impacts of the proposed alternative with potential other past, present, and reasonably foreseeable future actions. Therefore it was necessary to identify other

ongoing or foreseeable future projects affecting these units and, if applicable, the surrounding region. No reasonably foreseeable future projects are anticipated which, in combination with the proposed project, may impact BBNP, GMNP, or ANRA. However, occasional overflights (i.e., radio telemetry, GIS mapping, military training routes) may occur over park units. Overflights for the purposes of ORVAC bait distribution activities would only occur once per year and aircraft will only fly momentarily over one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait distribution. The potential impact would be of short-term duration, on a local scale, with negligible intensity. Therefore, cumulative impacts from the combination of ORVAC bait distribution overflights and other park unit overflights should be negligible (see Chapter 2 for additional information).

Resource Values. The following resource values would not be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range.

Irreversible and Irretrievable Commitment of Resources. Other than minor uses of fuels for aircraft and motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

4.1 Potential for adverse effects on people that become exposed to the vaccine or the baits.

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

Direct tests of the safety of V-RG in humans have not been conducted, for understandable reasons. Prior EAs by APHIS have analyzed in detail the potential for adverse effects on humans from V-RG exposure as a result of ORVAC experimental programs (USDA 1991, 1992).

Potential to cause rabies in humans.

The nature of the recombinant virus used as the V-RG vaccine is such that it cannot cause rabies. This is because the V-RG vaccine only carries the gene for producing the outer coating of the rabies virus (i.e., rabies virus *glycoprotein*) and not those portions of the virus that could result in replication of the rabies virus. Replication of the virus would be necessary for the disease to occur.

Implementation of the ORVAC program would reduce the risk of humans contracting rabies by reducing the chance of encountering rabid animals that have been infected by the gray fox variant of the disease.

Potential for vaccinia virus to cause disease in humans.

The vaccinia virus portion of the V-RG vaccine has been recognized as having the potential to cause infections in persons exposed to the vaccine, either through direct contact with the liquid or through contact with the mouth of an animal that has recently ingested the oral vaccine (USDA 1991, p. 39). Because the vaccinia virus used in the V-RG vaccine is the same type of virus that was used in smallpox eradication, although more *attenuated* or weakened, persons who have been immunized against smallpox would likely not experience any adverse reaction to the vaccinia virus, but would likely experience at worst a "booster" in immunity against vaccinia virus. However, the routine administration of smallpox vaccinations was discontinued after smallpox was eradicated. Thus, a large percentage of the population (particularly younger individuals) has not been vaccinated against vaccinia. Vaccinia virus rarely poses much risk of serious health effects – even when it was *directly applied* (via "scarification" or by scratching the skin) to many hundreds of millions of people during smallpox eradication campaigns, the number that developed vaccinia virus-related illness was only a few per million. In most of those cases the extent of the illness was a mild fever and some lesions or pustules at the site of the injection, followed by full recovery and subsequent immunity to the vaccinia virus (USDA 1991, p. 39; Elvinger 2001). In

most people, localized lesions occurred around the site on the arm where the smallpox vaccine was applied, but this a normal and expected response and, in general, no cause for concern.

More severe complications involving the central nervous system (CNS) can occur with vaccinia virus and the nature of these complications is generally thought to be allergic in nature (USDA 1991, p. 39). CNS complications occurred at an average rate of 3 per million among persons vaccinated with vaccinia virus (e.g., to prevent smallpox) with about 10 to 30% of those cases resulting in death (USDA 1991, p. 39). Thus, the chance of a person dying from direct application of a high dose of vaccinia virus via scarification would be about 1 in a million cases or less. With ORVAC baits distributed in the wild, people would run far less risk of being exposed to vaccinia virus or the V-RG vaccine in a way similar to deliberate smallpox vaccinations, but would primarily only run the risk of skin contact by handling broken baits or coming into contact with the oral regions of pets that had just consumed a bait. For that type of exposure, the chance of adverse effects from human infection with vaccinia virus would be far less than 1 in a million.

Another highly important characteristic of the V-RG vaccine is that it is weaker (more "attenuated") than the original parent vaccinia strain used in making it (USDA 1991, p. 18-19). This characteristic even further reduces the risk of V-RG vaccine causing vaccinia-related illness in humans.

Persons with immune system deficiencies (e.g., AIDS) run a relatively greater risk of experiencing adverse effects if directly exposed to the vaccinia virus than would persons with normal immune systems (USDA 1991, p. 40; USDA 1995a; USDA *undated a;* USDA *undated b*). Experiments in mice suggest that immune-deficient people would be at minimal risk of adverse effects when exposed to V-RG vaccine (Hanlon et al. 1997; USDA 1991, p. 41 and Appendix E therein). To aid in further minimizing the potential for adverse effects on humans because of contact with V-RG vaccine, each ORVAC bait contains a warning label advising persons who make contact with baits or the vaccine liquid to contact a telephone number for further guidance.

An indirect source of information on this issue is the safety record of laboratories that have worked with the V-RG vaccine (USDA 1991, p. 27). Ordinarily, lab personnel working with infectious materials or animals are protected by immunization and by procedures and equipment that minimize risk. V-RG vaccine has been completely safe for humans in laboratory situations (USDA 1991, p. 27). Potential non-laboratory exposure of humans in the various European field trials of V-RG vaccine has been considerable, with no program in place that monitors antibody levels of residents before and after the field trials. However, there have not been any reports of increased incidence of sickness in the field trial areas that could be attributable to the V-RG vaccine (USDA 1991, p. 27; Moore, TX Dept. of Health, pers. comm. 2001 *in* USDA 2001).

Studies of the effects of V-RG vaccine on nonhuman primates can provide an indication of the potential to affect humans (USDA 1991, p. 27). Studies in which squirrel monkeys (*Saimiri sciureus*) and chimpanzees (*Pan troglodytes*) were inoculated with the V-RG vaccine demonstrated that indirect human exposure to the vaccine that might occur via a bite or from contact with body fluids of a recently vaccinated animal is unlikely to produce adverse effects in healthy individuals (Rupprecht et al. 1992b; USDA 1991, p. 27).

McGuill et al. (1998) conducted a retrospective 4-year survey of directors of 6 ORVAC programs using V-RG vaccine that were conducted from 1992-1996 to evaluate the potential for human health problems. The programs occurred in Florida (2), Massachusetts (6), New Jersey (6), New York (7), and Texas (2). Altogether, they involved a total of 42,181 sq miles of treated area and a total of nearly 6 million baits distributed. Human contacts with the baits totaled 316, of which 53 resulted in contact with the actual vaccine liquid. The directors of all programs reported that human contact was minimal and that there were no reported adverse reactions in people exposed to the baits. Human contact with the baits was more likely in areas where bait had white labels vs. lettering in black ink, and the authors speculated the reason to be because the white labeled baits

were more visible and thus more likely to be noticed. The authors concluded that, based on their survey, major concerns about public health risks from V-RG vaccine were unfounded.

Recently in Ohio there was a documented exposure to vaccinia virus that resulted when a woman was bitten by her dog while trying to take away an ORVAC bait. The vaccine liquid was exposed to the bite area, resulting in localized inflammation and pox virus lesions at the site of the bite, as well as a whole body rash. She further experienced sloughing of the outer layers of skin from some portions of her body, similar to what occurs in the skin condition eczema (Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001). The woman, who was in her first trimester of pregnancy, is reported to have recovered from complications and gave birth to a 10-lb. baby boy with no apparent adverse health effects (Krogwold, OH Dept. of Health, pers. comm. 2001 *in* USDA 2001). Most recent reports attribute her response to the vaccinia virus as due likely to the reduced state of immunity typical during pregnancy and an underlying skin disorder (epidermolytic hyperkeratosis) that the woman already had (Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001). The woman also tested positive for rabies antibodies three weeks after the exposure, indicating she may also have developed rabies immunity (Rupprecht et al. *unpublished* 2000). This type of incident appears to be unusual, but, nevertheless, points to the need for continued public information and education activities and field surveillance for accidental human exposure to the V-RG virus. Additionally, recent bait exposure information during an ORVAC project in eastern PA (August-September, 2002) revealed that out of 1,283,521 baits distributed over approximately 16,755 sq. km, 67 humans or pets were exposed to a bait. This equates to 0.005 percent of distributed baits being found by pets or people. In at least 42 of the 67 exposure cases, the household pet (dog or cat) found the bait; however, the bait and sachet or sachet alone was normally still intact (at least 72% of cases). Of the 8 cases where the sachet was ruptured, pets or humans did not experience the development of an adverse reaction (i.e., lesions) (O'Reilly, CDC, pers. comm. 2002). However, unlike national parks, this ORVAC project involved bait distribution in several urban areas. Therefore, pets and other domestic animals were more likely to find the baits and are the primary source for potential and human exposure to ORVAC baits. On NPS lands, human exposure cases can be expected to be much lower.

Although there is no approved anti-viral compound available yet for treatment of suspected vaccinia virus complications, the CDC can make vaccinia immune globulin available to the state on a case-by-case basis, with a requirement that certain specimens (such as acute and convalescent sera and swabs/scabs of the affected site) be collected for diagnosis (Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001). This option provides some level of additional assurance that severe adverse effects on humans from vaccinia virus reactions would be successfully treated to avoid significant public health problems.

A recent study indicates vaccinia virus that originated from a strain used in smallpox vaccinations in Brazil may have become established in domestic cows in that country (Damaso et al. 2000). This indicates there is some potential for the use of vaccinia virus to result in a new emerging infectious disease. There is currently no evidence that this type of phenomenon has occurred in the U.S. (Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001). Also, the vaccinia virus strain used for smallpox vaccination in Brazil was different than the strain that is currently used in the V-RG vaccine, and the vaccinia virus portion of V-RG is more attenuated (i.e., *weaker*) than the strains used in smallpox vaccines (USDA 1991, p. 18-19). Thus, it is less likely that V-RG vaccine would result in the establishment and persistence of vaccinia virus in wild or domestic animals. However, no surveillance or testing of animals for this virus has been done in the U.S. to test this hypothesis (Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001).

The above information shows there is some potential for unusual circumstances to result in short-term adverse health effects from exposure to the vaccinia virus in the V-RG vaccine. However, the overall risk of such effects appears to be negligible based on the extremely low rate of reported occurrences in ORVAC programs.

Potential to cause cancer (oncogenicity).

This issue has been addressed in a previous EA and in formal risk analyses (USDA 1991, p. 40; USDA *undated a, undated b*). Vaccinia virus is not known to be a tumor-inducing virus. There have been no documented reports of oncogenicity associated with natural vaccinia virus infections in any animal species. The recombinant DNA methods used for preparation of the V-RG vaccine do not introduce any known oncogenes (i.e., cancer-causing genes) into the vaccinia virus strain that could cause it to become tumor-inducing.

Cumulative Impacts: Cumulative impacts of the proposed ORVAC program would likely be beneficial given that the possibility of humans becoming exposed to gray fox variant of the rabies virus would be reduced with this program. The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to humans. A limited number of baits would be distributed one time per year on an annual basis, thereby limiting the amount of exposure a person may have to an ORVAC bait or bait distributing equipment. Cumulative impacts to humans would likely be beneficial. Any adverse impacts to humans from exposure to the vaccine or baits would be negligible.

Conclusion: Based on this information, risks to humans from contact with the V-RG vaccine are believed to be negligible. The risk and potential severity of adverse effects from rabies exposures in humans would probably be greater without ORVAC programs than would be the risk of serious adverse effects from vaccinia virus infections with ORVAC programs. Implementation of an ORVAC program would likely have a beneficial impact to humans. This alternative would support the state of Texas in the effort of reducing or possibly eliminating of this strain of the virus from West-Central Texas.

Alternative 2 - No action (no involvement in rabies prevention or control)

Potential to cause rabies in humans.

The risk of humans being exposed to the vaccine or baits would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA. The no action alternative would most likely result in greater risk of human exposure to rabies than the proposed action because the TDH ORVAC program would have less chance of being successful in stopping or preventing the spread of the gray fox rabies variant.

Potential for vaccinia virus to cause disease in humans.

This risk would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Potential to cause cancer (oncogenicity).

This risk would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in human exposure to the gray fox variant of the rabies virus. Reservoirs of the virus could remain in untreated areas making the total elimination of this strain of the virus highly unlikely. This alternative could result in moderate, adverse cumulative impacts to humans. No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: There would be no direct impact to humans as ORVAC baits would not be distributed and humans would, therefore, not be exposed the vaccine or baits. However, there could be an indirect adverse cumulative impact from increased human exposure to the gray fox variant of the rabies virus. This alternative would not support the efforts of the State of Texas in reducing or eliminating this strain of the virus form West-Central Texas.

4.2 Effects of the ORVAC V-RG vaccine on gray foxes.

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

The primary concern here is whether the V-RG virus may cause disease in gray foxes that consume ORVAC baits. V-RG vaccine safety tests reported no adverse effects in gray foxes (Rupprecht et al. 1992a). Extensive experimental field testing of V-RG vaccine with subsequent collections and necropsies of gray foxes in Texas have not produced any observed pathological signs of disease or other adverse effects on this species (Oertli, TX Dept. of Health, pers. comm. 2001 *in* USDA 2001). In addition, extensive laboratory and field testing of V-RG vaccine in many nontarget species, including other closely related members of the Canid (dog) family (see Rupprecht et al. 1992a), indicates virtually no risk of oral baits containing V-RG adversely affecting gray fox populations.

Cumulative Impacts: Cumulative impacts would likely be beneficial as the proposed ORVAC program would reduce the possibility of gray foxes becoming infected with the rabies virus. The ORVAC vaccine and bait that would be used has been found safe to use on gray foxes. The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to gray foxes. Cumulative impacts to gray foxes would likely be beneficial as those foxes that consume baits would likely be vaccinated against the rabies virus.

Conclusion: Adverse impacts to gray foxes from contact with the V-RG vaccine are believed to be negligible. Implementation of an ORVAC program would likely have a beneficial impact to gray foxes by reducing the occurrence of the gray fox variant of the rabies virus in the wild. This alternative would support the state of Texas in the effort of reducing or possibly eliminating of this strain of the virus from West-Central Texas.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No action (no involvement in rabies prevention or control)

The potential effects of gray foxes being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in gray fox exposure to the rabies virus. Reservoirs of the virus could remain in untreated areas making the total elimination of this strain of the virus highly unlikely. This alternative could result in moderate, adverse cumulative impacts to foxes. No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: There would be no direct impact to gray foxes as ORVAC baits would not be distributed and foxes would, therefore, not be exposed to the vaccine or baits. However, there could be an indirect moderate adverse cumulative impact from increased animal exposure to the gray fox variant of the rabies virus. This alternative would not support the efforts of the State of Texas in reducing or eliminating this strain of the virus form West-Central Texas.

4.3 Potential for adverse effects on nontarget wildlife species, including threatened or endangered species.

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

The primary concern here is whether the vaccinia virus-rabies glycoprotein combination (i.e., Raboral V-RG® vaccine) might cause disease in nontarget animals that consume or otherwise come into contact with

the vaccine. Rupprecht et al. (1992a) and Pastoret et al. (1995) summarized the results of V-RG safety trials in nontarget species. More than 50 species from Europe and North America have been tested and include relevant taxonomic groups believed to be potentially at risk for contact with the V-RG vaccine such as:

- natural ecological competitors of foxes, such as raccoons (*Procyon lotor*), opossum (*Dedelphis virginianus*), several mustelids (skunk, badger, mink (*Mustela vision*), otter (*Lutra canadensis*), ferret (*Mustela putorius*), other members of the Canid family (coyote, red fox, gray fox, arctic fox (*Alopex lagopus*), raccoon dog (*Nyctereutes procyonoides*), bobcat (*Lynx rufus*), and black bear (*Ursus americanus*).
- Domestic cats (*Felix domesticus*) and dogs (*Canis familiaris*).
- 19 rodent species (Order *Rodentia*) that might be expected to gnaw on or consume baits. Families within this order represented in the studies included: *Muridae, Erethizonidae* (porcupine (*Erithizon dorsatum*)), *Sciuridae, Cricetidae,* and *Zapodidae*.
- 1 bat species (Daubenton's bat (*Myotis daubentoni*)).
- 8 bird species, including three hawk species (red-tailed hawk (*Buteo jamaicensis*), kestrel (*Falco tinnunculus*), common buzzard (*B. Buteo*), and one species each of owl (great horned owl (*Bubo virginianus*)), crow (carrion crow (*CORVACus corone*)), gull (ring-billed gull (*Larus delawarensis*)), magpie (*Pica pica*), and jay (*Garrulus glandarius*).
- Domestic livestock (cattle (*Bos taurus*), sheep (*Ovis ovis*)).
- Two wild ungulate species (wild boar (*Sus scrofa*), white-tailed deer (*Odocoileus virginianus*)).
- Two primate species (squirrel monkey and chimpanzee).

Rupprecht et al. (1992a) reported there has been no mortality or morbidity (i.e., signs or symptoms of disease) and no lesions typical of pox virus infections caused by V-RG vaccine in over 350 individual animals representing some 20 taxonomic families of animals. They concluded that the extensive laboratory safety experiments showed V-RG to be safe in all species tested to date. In field trials with V-RG ORVAC baits to treat wild raccoons in which target and nontarget species were captured and tested, no vaccine-related lesions or other adverse effects have been found to occur (Rupprecht et al. 1992a). The ORVAC program would reduce the likelihood of wildlife being exposed to the rabies virus.

There is no evidence of potential harm to target or nontarget species from overdosage of Raboral V-RG® vaccine by any route or from multiple doses. A number of nontarget species have been dosed with 2 to 10 times the amount of vaccine in an individual ORVAC bait without adverse effects (USDA 1991, p. 47; Rupprecht et al. 1992a). Therefore, even if domestic animals received multiple doses of vaccine by consuming multiple baits, no adverse effects would be expected to occur.

The Raboral V-RG® vaccine would not adversely affect any non-warm blooded animal species. The vaccina virus and other orthopoxviruses do not replicate or reproduce themselves in non-warm blooded species (Rupprecht, CDC, pers. comm.. 2002). Therefore, ORVAC is not expected to cause any adverse effects on fish, reptiles, amphibians, or any invertebrate species should any members of these species groups consume or otherwise be exposed to the vaccine.

With regard to threatened or endangered species, the Raboral V-RG® vaccine distributed in baits would have no adverse effects on any state or federally listed threatened or endangered species or their critical habitats (see Appendix C and D for species list). Several State listed carnivore species have been identified by the Texas Parks and Wildlife Department, Wildlife Diversity Program to occur within the counties affected by the proposed program, including the American black bear (Ursus americanus), Ocelot (Leopardus pardalis), Mexican gray wolf (Canis lupus), and white-nosed coati (Nasua narica). These species would likely be attracted to ORVAC baits. If these carnivore species came in contact with and consumed an ORVAC bait it would be expected that they would experience no effect other than possibly becoming immunized against rabies. No federally listed carnivore T&E species are known to occur within the counties affected by the proposed program.

The USFWS has reviewed the proposed ORVAC program and has concurred that the proposed program would not likely adversely affect any T&E species or their critical habitats (R.T Pine, USFWS, December 11, 2002, see Appendix G).

The Texas Parks and Wildlife Department, Wildlife Diversity Program has reviewed the proposed ORVAC program and has indicated that the proposed program will have no anticipated negative impacts to rare or natural communities (C. Brancel-Brown, Texas Parks and Wildlife Department, November 8, 2002).

Cumulative Impacts: There would be no adverse cumulative impacts of the proposed ORVAC program on nontarget wildlife species, including any state or federally listed threatened or endangered species. The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to nontarget wildlife species. Cumulative impacts to nontarget wildlife could possibly be beneficial as those species that consume baits may become vaccinated against the rabies virus. Additionally, the proposed program would reduce the likelihood of nontarget wildlife coming into contact with an animal infected with the rabies virus.

Conclusion: The Raboral V-RG® vaccine distributed in baits would have no adverse effects on nontarget wildlife species, including any state or federally listed threatened or endangered species. Implementation of an ORVAC program would likely have a minor beneficial impact by possibly immunizing other wildlife species against the gray fox variant of rabies and by reducing the likelihood of becoming exposed to an animal infected with the rabies virus. This alternative would support the state of Texas in the effort of reducing or possibly eliminating of this strain of the virus from West-Central Texas.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No action (no involvement in rabies prevention or control)

The risk of a nontarget wildlife species being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in exposure of nontarget wildlife to the rabies virus. Reservoirs of the virus could remain in untreated areas making the total elimination of this strain of the virus highly unlikely. This alternative could result in minor, adverse cumulative impacts to other wildlife species. No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of a nontarget wildlife species being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA. However, failure to stop or prevent the spread of rabies would result in adverse effects on wildlife by increasing the likelihood of exposure to an animal infected with the rabies virus. This alternative would not support the efforts of the State of Texas in reducing or eliminating this strain of the virus form West-Central Texas.

4.4 Potential for adverse effects on pet dogs or other domestic animals that might consume the baits.

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

Rupprecht et al. (1992a) and Pastoret et al. (1995) summarized the results of V-RG safety trials in nontarget species. These studies included the oral vaccination of domestic dogs, cats, cattle, and sheep and found no adverse effects on these species. More than 23 million ORVAC baits using the Raboral V-RG® vaccine have been distributed in the U.S. with no reported adverse effects on domestic animals. There is no evidence of potential harm to target or nontarget species, including domestic dogs, cats, cattle, and sheep,

from overdosage of Raboral V-RG® vaccine by any route or from multiple doses. A number of nontarget species have been dosed with 2 to 10 times the amount of vaccine in an individual ORVAC bait without adverse effects (USDA 1991, p. 47; Rupprecht et al. 1992a). Therefore, even if domestic animals received multiple doses of vaccine by consuming multiple baits, no adverse effects would be expected to occur.

As discussed in section 4.1.1, a recent study indicates vaccinia virus that originated from a strain used in smallpox vaccinations in Brazil may have become established in domestic cows in that country (Damaso et al. 2000). This indicates there is some potential for use of vaccinia virus in vaccinations to result in a new emerging infectious disease in domestic animals; however, there is currently no evidence that this type of phenomenon has occurred in the U.S. (Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001). Also, the vaccinia virus strain used for smallpox vaccination in Brazil was different than the strain that is currently used in the V-RG vaccine. The vaccinia virus portion of V-RG is more attenuated (i.e., *weaker*) than strains used in smallpox vaccines (USDA 1991, p. 18-19). Thus, it is less likely that V-RG would result in the establishment and persistence of vaccinia virus in wild animal populations.

There have been reported instances where a pet dog has consumed several baits and then vomited the plastic sachets (Hale, Ohio Dept. of Health, pers. comm. 2001 *in* USDA 2001). Reports of these types of instances have been few, and the dogs have reportedly not experienced any substantive or long term adverse effects.

Cumulative Impacts: There would be no adverse cumulative impacts of the proposed ORVAC program on pet dogs or other domestic animals. The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to these animals. Cumulative impacts to pets and other domestic animals could possibly be beneficial as those species that consume baits may become vaccinated against the rabies virus. Additionally, the proposed program would reduce the likelihood of pets and other domestic animals coming into contact with an animal infected with the rabies virus.

Conclusion: The Raboral V-RG® vaccine distributed in baits would have no adverse effects on pets or other domestic animals. Implementation of an ORVAC program would likely have a moderate beneficial impact by possibly immunizing these animals against rabies and reducing the likelihood of becoming exposed to an animal infected with the rabies virus. This alternative would support the state of Texas in the effort of reducing or possibly eliminating of this strain of the virus from West-Central Texas.

Alternative 2 - No action (no involvement in rabies prevention or control)

The risk of a pet dog or domestic animal being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in exposure of pets and other domestic animals to the rabies virus. Reservoirs of the virus could remain in untreated areas making the total elimination of this strain of the virus highly unlikely. This alternative could result in moderate, adverse cumulative impacts to pets and other domestic animals. No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of a pet dog or domestic animal being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA. However, failure to stop or prevent the spread of rabies would result in adverse effects on domestic animals by increasing the likelihood of exposure to rabid wild animals. This alternative would not support the efforts of the State of Texas in reducing or eliminating this strain of the virus form West-Central Texas.

4.5 Potential for the recombined V-RG virus to "revert to virulence" and result in a virus that could cause disease in humans or animals.

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

The concern here is whether the V-RG recombinant virus is genetically stable so that it would not become virulent (i.e., capable of causing disease) after it replicates (or reproduces) in animals that consume ORVAC baits containing the Raboral V-RG® vaccine and, perhaps, be transmitted on to other animals. This issue was addressed in previous EAs and in formal risk assessments by USDA, APHIS (USDA 1991, p. 41-42; USDA *undated a*, *undated b*). The Wistar Institute conducted experiments with mice in which the V-RG was "subpassaged[3]" four times into groups of mice (results cited in USDA 1991, p. 41). The V-RG virus could not be found after passage through the second or third groups of mice. These experiments demonstrated that the ability of the V-RG virus to cause disease does not increase by repeated animal passage, thus "reversion to virulence" is unlikely. Further alleviating the concern about this issue is the evidence that V-RG virus does not transmit readily to other animals from animals that have consumed ORVAC baits (Rupprecht and Kieny 1988).

Cumulative Impacts: Adverse cumulative impacts of the proposed ORVAC program as a result of the potential for the recombined V-RG virus to "revert to virulence" would be negligible.

Conclusion: The potential for the recombined V-RG virus to "revert to virulence" would be negligible. The Raboral V-RG® vaccine distributed in baits would have no adverse effects on humans or animals.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No action (no involvement in rabies prevention or control)

This risk would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Cumulative Impacts: No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of the recombined V-RG virus "reverting to virulence" would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

4.6 Potential for the Raboral V-RG® vaccine to recombine with other viruses in the wild to form new viruses that could cause disease in humans or animals.

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

The concern here is whether the Raboral V-RG® vaccine in the ORVAC baits might encounter other viruses in animals, exchange genetic material with them during replication, and result in new viruses that could cause serious diseases in humans or animals. This potential recombination has been recognized as being more probable with wild pox viruses that are genetically similar to the vaccinia virus used as the vector in the Raboral V-RG® vaccine. Wild pox viruses present in the U.S. include skunk, rodent, and raccoon pox (RP) viruses (Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001). RP has not been found to be prevalent in the environment, with only two concurrent isolations (or detections) of it having occurred in the U.S. (Herman 1964, cited in USDA 1991, p. 42).

For these types of unanticipated spontaneous recombinations to occur, the V-RG and RP would have to simultaneously infect the same cells in the same animal at the same time. The Wistar Institute identified three circumstances that would have to occur simultaneously for there to be a chance of a hazardous recombination between V-RG and RP virus: (1) they would have to occur at the same time in the same

[3] This means the V-RG was inoculated into one group of mice from which material containing the virus was obtained later and injected into a second group of mice, and then material obtained from the second group was injected into a third group, etc., until four such passages had been conducted.

animal; (2) "genome contact" (i.e., contact between the actual genetic material in the two viruses as they replicate in an infected cell); *and* (3) the regeneration of the gene that was previously removed from the vaccinia virus (known as the thymidine kinase "TK" gene) (USDA 1991, p. 42). Wistar determined the probability of all three circumstances occurring at the same time was 1 chance in 100 million or less (USDA 1991, p. 42). Also, if this did somehow occur resulting in a recombined virus with the functional "TK" gene reestablished, the properties and virulence of the new virus would probably be similar to the original recipient virus which is vaccinia (USDA *undated b*, p. 28). Vaccinia only causes mild short-term symptoms in most cases (i.e., similar to the localized rash and pustules that occurred on the arms of many persons who received smallpox vaccinations) (USDA 1991, p. 39; Elvinger 2001). Thus, recombination with wild viruses is unlikely, but, if it did occur, it is also unlikely to result in significant adverse effects on animals or people. Laboratory experiments on mice infected with RP and inoculated with V-RG showed no adverse effects on the mice (USDA, 1991, p. 42).

Combination of two types of pox viruses in rabbits or hares (leporipoxviruses) has been known to occur (Omlin 1997), but the combination of a leporipoxvirus with another unrelated pox virus has not been known to occur (USDA 1991, p. 42). Rare examples of recombination between different poxviruses in animal hosts have been documented, although the probability of two viruses infecting the same cell at the same time (which is required for recombination to occur) under natural conditions remains very low (Omlin 1997). Recombination of V-RG with viruses other than orthopoxviruses is not likely (Omlin 1997). In formal risk analyses, APHIS concluded that the probability of recombination with other orthopoxviruses would be limited due to the low prevalence of orthopoxviruses in wildlife species in the U.S. (USDA *undated a, b*).

Hahn (1992) concluded that vaccines developed by the newer genetic engineering (i.e., recombinant) techniques such as the ones used to make V-RG vaccine are no more hazardous than vaccines created by more conventional methods (e.g., "attenuation" and "fractionation"). He further indicated that, with recombinant technology, the potential for ending up with a dangerous virulent strain is probably less than with the older "hit-or-miss" methods, because the specific genetic material responsible for making a virus virulent can be removed or altered which makes the virus safer.

Cumulative Impacts: Adverse cumulative impacts of the proposed ORVAC program as a result of the potential for the Raboral V-RG vaccine to recombine with other viruses to form new viruses that could cause disease in humans or animals would be negligible.

Conclusion: This analysis, which incorporates previous analyses by reference, supports a conclusion that adverse environmental effects from spontaneous recombination of V-RG with other wild viruses would be exceedingly unlikely and negligible. This is further supported by the fact that there have been no observed adverse effects in wildlife and humans both in Europe and North America following a number of years of experimental and field use of the V-RG vaccine.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No action (no involvement in rabies prevention or control)

This risk would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Cumulative Impacts: No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of the Raboral V-RG vaccine recombining with other viruses to form new viruses that could cause disease in humans or animals would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

4.7 Potential for aerially dropped baits to strike and injure people or domestic animals.

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

ORVAC baits would be distributed from aircraft at an average density of 100 per sq mile. This density is sparse enough to predict that the chance of a person being struck and harmed by a falling bait is extremely remote. For example, if 100 persons were standing outdoors in a square mile of area in which ORVAC baits were being dropped, and each person occupies about 2 square feet of space at the time that baits were dropped, the chance of being struck would be 1 in 139,000 (200 sq ft total space occupied by persons divided by 27.8 million sq ft per sq mi). The negligible risk of being struck is further supported by the fact that out of more than 33 million ORVAC baits distributed from aircraft in the U.S. and Canada since 1990, there have been only a four incidents in which a person reported being struck by a falling bait. These incidents occurred in Texas, Ohio, and Ontario and did not result in any substantial injury or harm to the individuals involved (Moore, TX Dept. of Health, pers. comm. 2001 *in* USDA 2001; Hale, OH Dept. of Health, pers. comm. 2001 *in* USDA 2001; MacInnes, Ontario Ministry of Natural Resources, pers. comm. 2001 *in* USDA 2001). This effect is further mitigated by the fact that bait drop crews avoid dropping baits into cities, towns, and other areas with human dwellings, or if humans are observed below. Hand placement or dropping of baits from slower moving helicopters to allow for more precise control over areas frequently used by visitors (visitor centers, parking areas, etc.) would further reduce the risk of being struck. Additionally, in areas where backcountry campgrounds are difficult to discern from the air, bait drops would be coordinated to alert campers of the situation or would be conducted when hiking/camping densities are low (i.e., winter months).

Cumulative Impacts: Adverse cumulative impacts of the proposed ORVAC program as a result of the potential for aerially dropped baits to strike and injure people or domestic animals would be negligible.

Conclusion: The chance of a person or animal being struck and harmed by a falling bait would be extremely remote. To further mitigate the possibility of striking people or animals, bait drop crews would avoid areas containing human dwellings.

Alternative 2 - No action (no involvement in rabies prevention or control)

This risk would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Cumulative Impacts: No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: There would be no risk of aerially dropped baits striking and injuring people or domestic animals since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

4.8 Potential effects on NPS wilderness areas

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

There is concern that the proposed ORVAC program may result in adverse effects on the designated wilderness area located at GMNP. The proposed program would be conducted in accordance with The Wilderness Act of 1964 (P.L. 88-577). The Act, in part, defines a wilderness area as:

> *"A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural condition"*

The act prohibits and restricts certain uses of these designated lands. The Act provides special provisions to allow certain activities to take place within designated wilderness areas such as the use of aircraft to control fire, insects and diseases (Sec. 4 (d)). The use of aircraft for the purpose of distributing ORVAC baits to prevent or stop the spread of the rabies virus would be conducted under such a special provision.

The only part of the ORVAC program that has potential to effect a wilderness area is the aerial distribution of baits. However, the visual and auditory impacts that an aircraft may have on a designated wilderness are expected to be negligible. ORVAC program aerial bait distribution activities are not chronic, but only occur once per year. They are typically conducted during the month of January; at about 500 feet above ground level; and only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution. This one time annual event should result in negligible impacts to designated wilderness areas.

Cumulative Impacts: Adverse cumulative impacts of the proposed ORVAC program as a result of the potential for negative effects to NPS wilderness areas would be negligible.

Conclusion: The only part of the ORVAC program that has potential to affect a wilderness area is the aerial distribution of baits. However, the visual and auditory impacts that an aircraft may have on a designated wilderness would be negligible.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No action (no involvement in rabies prevention or control)

The potential effects on wilderness areas would not occur since ORVAC baits would not be distributed on GMNP.

Cumulative Impacts: No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of negatively impacting NPS wilderness areas would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

4.9 Potential impacts on visitor use/experience

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

Many people visit NPS lands each year to escape the sounds and sights of everyday life. Others visit these areas to experience nature in its "natural" state or just to experience the serenity that a NPS park can provide. These people are concerned that the ORVAC program may adversely affect a person's outdoor experience when visiting ANRA, BBNP, and GMNP.

Impacts of ORVAC program overflights

Some people have expressed that overflights of aircraft involved in the distribution of ORVAC baits may adversely impact visitor use and overall park experience. The natural quiet is an important natural resource of the NPS (USDI 1995). The ORVAC program recognizes this concern and attempts to limit a person's exposure to bait distributing aircraft.

Effects on park visitors can be highly variable depending upon the park activities utilized by the visitor (USDI 1995). Backcountry visitors (people using remote areas of the park that are

inaccessible by vehicles) would likely be affected to a greater extent than frontcountry visitors (people using areas that are accessible to vehicles).

In general, it appears that the more serious potential impacts occur when overflights are *chronic*, i.e., they occur daily or more often over long periods of time. Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. ORVAC program aerial bait distribution activities are not chronic, but only occur once per year. They are typically conducted during the month of January; at about 500 feet above ground level; and only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution. There is a possibility that a visitor may be exposed to a brief encounter with an aircraft distributing baits but not to the extent that a person would be exposed repeatedly or for an extended period of time.

Due to the limited amount of exposure to bait distributing aircraft, it is highly unlikely that a person's park experience would be seriously be impacted by this action.

Impacts of finding an ORVAC bait or vaccine sachet

People visiting ANRA, BBNP, and GMNP are concerned that their park experience may be lessened as a result of finding an unconsumed bait or empty sachet. The likelihood of this occurring is extremely low due to the limited number of baits that are dropped in a specific area, the biodegradability of the vaccine liquid and baits, and the high consumption rate of ORVAC baits by animal species.

The possibility of a person coming in contact with an ORVAC bait is extremely low due to the bait distribution densities used by the program. Under the proposed program, ORVAC baits would be distributed once a year at an average density of 100 per square mile. Furthermore, McGuill et al. (1998) conducted a retrospective 4-year survey of directors of 6 ORVAC programs using V-RG vaccine from 1992-1996. The programs occurred in Florida (2), Massachusetts (6), New Jersey (6), New York (7), and Texas (2). Altogether, they involved a total of 42,181 sq miles of treated area and a total of nearly 6 million baits distributed. Human contacts with the baits totaled 316.

The baits used for the gray fox ORVAC program are small blocks of dog food that are held together with a polymer binding agent and are considered to be "food grade" materials. Therefore, the unconsumed bait material would quickly biodegrade when exposed to the environment.

The ORVAC baits are readily taken up and consumed by wildlife species thereby reducing the possibility of a person coming into contact with an ORVAC bait. The likelihood of a bait being consumed is dependent upon several factors including animal densities (target and non-target species), bait preference, and the availability of alternative food sources. In field tests conducted in the U.S., the majority of ORVAC baits have been consumed within the first 7 to 14 days after placement, with reports of up to 100% of the baits being consumed within a 7 day period (Farry et al. 1998b, Hable et al. 1992, Hadidian et al. 1989, Hanlon et al. 1989, Linhart et al. 1994, Steelman et al. 2000; USDA 1995a).

There is a remote possibility that a park visitor may encounter a sachet since they are not readily digested by animals that consume ORVAC baits. This type of occurrence is expected to be minimal. Since the Texas ORVAC program began in 1995, the TDH has distributed over 17.5 million individual doses of ORVAC over a 225,500 sq. mile area in South and west-central Texas (Oertli et al. 2002). The TDH has not received any reports of a person coming into contact with a full or empty sachet as a result of dropping these 17.5 million baits (Oertli ,TX Dept. of Health, pers. comm. 2002).

Risk of being exposed to a rabid animal

The risk of a park visitor being exposed to a rabid animal would be greatly reduced under this alternative. ORVAC programs have been successful in eliminating and preventing the spread of wildlife rabies throughout the U.S. (USDA 2001, Oertli et al. 2002). The gray fox ORVAC program in West-Central Texas has been successful in reducing the number of reported cases of the gray fox rabies variant from 188 cases in 1995 to 20 cases in 2001with 73% of the foxes tested in the bait drop zone showing a positive serologic response to the vaccine in 2001 (Oertli et al. 2002). A similar response to the program can be expected to occur at ANRA, BBNP, and GMNP.

Cumulative Impacts: The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to humans. A limited number of baits would be distributed one time per year on an annual basis, thereby limiting the amount of exposure a person may have to an ORVAC bait or bait distributing equipment (i.e., aircraft). Cumulative impacts to humans would likely be beneficial as the proposed ORVAC program would reduce the risk of humans encountering a rabid animal. Any adverse impacts to humans from exposure to the vaccine or baits would be negligible.

Conclusion: The ORVAC program should have no adverse effects on visitor use/experience (i.e., noise from bait distributing aircraft, finding a bait or sachet, and encountering a rabid animal) at ANRA, BBNP, and GMNP. Due to the limited amount of exposure to a bait distributing aircraft, it would be highly unlikely that a person's park experience would be seriously impacted by this action. Although there would be a remote possibility that a park visitor may encounter a sachet since they are not readily digested by animals that consume ORVAC baits, the potential would be negligible. The risk of a park visitor being exposed to a rabid animal would be greatly reduced under this alternative.

Alternative 2 - No action (no involvement in rabies prevention or control)

Impacts of aerial distribution of ORVAC baits

The potential impacts of aerial distribution of baits would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Impacts of finding an ORVAC bait or vaccine sachet

The potential impacts of finding an ORVAC bait or sachet would not occur since ORVAC baits would not be distributed on BBNP, GMNP, and ANRA.

Risk of being exposed to a rabid animal

The risk of a park visitor being exposed to a rabid animal would not be reduced under this alternative. This potential risk could adversely impact a person's park experience if the visitor is concerned with being exposed to or coming in contact with a rabid animal.

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in human exposure to a rabid animal since animals would not receive vaccination by ORVAC bait distribution. This alternative could result in moderate, adverse cumulative impacts to humans. No other cumulative impacts on visitor use/experience, such as impacts of aerial distribution of ORVAC baits or impacts of finding an ORVAC bait or vaccine sachet, would occur since no ORVAC baits would be used.

Conclusion: The potential impacts of aerial distribution of baits and finding an ORVAC bait or sachet would not occur since ORVAC baits would not be distributed on NPS lands. However, the risk of a park visitor being exposed to a rabid animal would not be reduced under this alternative since ORVAC baits would not be distributed on NPS lands. This alternative could result in moderate, adverse cumulative impacts to humans.

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Texas Water Development Board	Texas Historical Commission
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Judge Roy Bean Visitor Center	Val Verde County Commission
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City of Carlsbad	Amistad Acres Property Owners
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PETA	Predator Defense Institute
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Endangered Species Coalition	Friends of Animals
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APPENDIX B
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APPENDIX C
Species Listed as Threatened or Endangered in the State of Texas
under the Federal Endangered Species Act

(Information obtained from U.S. Fish and Wildlife Service web site http://endangered.fws.gov/ and U.S. Fish and Wildlife Service, Ecological Services, Austin, TX)

Animals - 63

T	Alligator, American (Alligator mississippiensis)
E	Amphipod, Peck's cave (Stygobromus pecki)
E	**Bat, Mexican long-nosed (Leptonycteris nivalis) ***
T	Bear, American black (Ursus americanus)
T	Bear, Louisiana black (Ursus americanus luteolus)
E	Beetle, Coffin Cave mold (Batrisodes texanus)
E	Beetle, Comal Springs dryopid (Stygoparnus comalensis)
E	Beetle, Comal Springs riffle (Heterelmis comalensis)
E	Beetle, Kretschmarr Cave mold (Texamaurops reddelli)
E	Beetle, Tooth Cave ground (Rhadine persephone)
E	**Crane, whooping (Grus americana) ***
E	Curlew, Eskimo (Numenius borealis)
E	Darter, fountain (Etheostoma fonticola)
T	**Eagle, bald (Haliaeetus leucocephalus) ***
E	**Falcon, northern aplomado (Falco femoralis septentrionalis) ***
E	**Flycatcher, southwestern willow (Empidonax traillii extimus) ***
E	**Gambusia, Big Bend (Gambusia gaigei) ***
E	Gambusia, Clear Creek (Gambusia heterochir)
E	Gambusia, Pecos (Gambusia nobilis)
E	Gambusia, San Marcos (Gambusia georgei)
E	Ground beetle, [unnamed] (Rhadine exilis)
E	Ground beetle, [unnamed] (Rhadine infernalis)
E	Harvestman, Bee Creek Cave (Texella reddelli)
E	Harvestman, Bone Cave (Texella reyesi)
E	Harvestman, Robber Baron Cave (Texella cokendolpheri)
E	Jaguar (Panthera onca)
E	Jaguarundi, Gulf Coast (Herpailurus yagouaroundi cacomitli)
E	Manatee, West Indian (Trichechus manatus)
T	**Minnow, Devils River (Dionda diaboli) ***
E	Minnow, Rio Grande silvery (Hybognathus amarus)
E	Mold beetle, Helotes (Batrisodes venyivi)
E	Ocelot (Leopardus pardalis)
T	**Owl, Mexican spotted (Strix occidentalis lucida) ***
E	**Pelican, brown (Pelecanus occidentalis) ***
T	**Plover, piping (Charadrius melodus) ***
E	Prairie-chicken, Attwater's greater (Tympanuchus cupido attwateri)
E	Pseudoscorpion, Tooth Cave (Tartarocreagris texana)
E	Pupfish, Comanche Springs (Cyprinodon elegans)
E	Pupfish, Leon Springs (Cyprinodon bovinus)
E	Salamander, Barton Springs (Eurycea sosorum)
T	Salamander, San Marcos (Eurycea nana)
E	Salamander, Texas blind (Typhlomolge rathbuni)
T	Sea turtle, green (except where endangered) (Chelonia mydas)
E	Sea turtle, hawksbill (Eretmochelys imbricata)
E	Sea turtle, Kemp's ridley (Lepidochelys kempii)
E	Sea turtle, leatherback (Dermochelys coriacea)
T	Sea turtle, loggerhead (Caretta caretta)
T	Shiner, Arkansas River (Arkansas R. Basin) (Notropis girardi)

T Snake, Concho water (Nerodia paucimaculata)
E Spider, Government Canyon cave (Neoleptoneta microps)
E Spider, Madla's cave (Cicurina madla)
E Spider, Robber Baron cave (Cicurina baronia)
E Spider, Tooth Cave (Neoleptoneta myopica)
E Spider, Vesper cave (Cicurina vespera)
E Spider, [unnamed] (Cicurina venii)
E Tern, least (interior pop.) (Sterna antillarum) *
E Toad, Houston (Bufo houstonensis)
E Vireo, black-capped (Vireo atricapillus) *
E Warbler, golden-cheeked (Dendroica chrysoparia) *
E Whale, finback (Balaenoptera physalus)
E Whale, humpback (Megaptera novaeangliae)
XN Wolf, gray Mexican gray wolf, EXPN population (Canis lupus)
E Woodpecker, red-cockaded (Picoides borealis)

Plants - 28

E Sand-verbena, large-fruited (Abronia macrocarpa)
E Ambrosia, south Texas (Ambrosia cheiranthifolia)
E Cactus, Tobusch fishhook (Ancistrocactus tobuschii) *
E Cactus, star (Astrophytum asterias)
E Ayenia, Texas (Ayenia limitaris)
E Poppy-mallow, Texas (Callirhoe scabriuscula)
E Cactus, Nellie cory (Coryphantha minima) *
T Cory cactus, bunched (Coryphantha ramillosa) *
E Cactus, Sneed pincushion (Coryphantha sneedii sneedii)
E Cat's-eye, Terlingua Creek (Cryptantha crassipes) *
T Cactus, Chisos Mountain hedgehog (Echinocereus chisoensis chisoensis) *
E Cactus, black lace (Echinocereus reichenbachii albertii)
E Pitaya, Davis' green (Echinocereus viridiflorus davisii) *
T Cactus, Lloyd's Mariposa (Echinomastus mariposensis) *
E Frankenia, Johnston's (Frankenia johnstonii)
T Sunflower, Pecos (Helianthus paradoxus)
E Rush-pea, slender (Hoffmannseggia tenella)
E Dawn-flower, Texas prairie (Hymenoxys texana)
E Bladderpod, white (Lesquerella pallida)
E Bladderpod, Zapata (Lesquerella thamnophila)
E Manioc, Walker's (Manihot walkerae)
E Phlox, Texas trailing (Phlox nivalis texensis)
E Pondweed, Little Aguja Creek (Potamogeton clystocarpus)
T Oak, Hinckley (Quercus hinckleyi) *
E Ladies'-tresses, Navasota (Spiranthes parksii)
E Snowbells, Texas (Styrax texanus) *
E Dogweed, ashy (Thymophylla tephroleuca)
E Wild-rice, Texas (Zizania texana)
T Gypsum wild-buckwheat (Eriogonum gypsophilum) *

*** Federally Listed Threatened and Endangered Species for the Texas counties of Val Verde, Brewster, Hudspeth, and Culberson.**

APPENDIX D
Species Listed as Threatened, Endangered, or Special Status under State Laws in Texas

(Information obtained from Texas Parks and Wildlife web site http://www.tpwd.state.tx.us and Texas Biological and Conservation Data System for the Texas counties of Val Verde, Brewster, Hudspeth, and Culberson)

Animals - 131

E	Amphipod, Peck's cave (Stygobromus pecki)
E	**Bat, Mexican long-nosed (Leptonycteris nivalis) ***
T	Bat, Rafinesque's big-eared (Corynorhinus rafinesquii)
T	Bat, southern yellow (Lasiurus ega)
T	**Bat, spotted (Euderma maculatum) ***
T	**Bear, American black (Ursus americanus) ***
T	Bear, Louisiana black (Ursus americanus luteolus)
T	Becard, rose-throated (Pachyramphus aglaiae)
T	**Black-hawk, common (Buteogallus anthracinus) ***
T	Blindcat, toothless (Trogloglanis pattersoni)
T	Blindcat, widemouth (Satan eurystomus)
T	**Coati, white-nosed (Nasua narica) ***
T	Chub, Rio Grande (Hybognathus amarus)
T	Chubsucker, creek (Erimyzon oblongus)
E	Crane, whooping (Grus americana)
E	Curlew, Eskimo (Numenius borealis)
T	Darter, blackside (Percina maculate)
E	Darter, fountain (Etheostoma fonticola)
T	**Darter, Rio Grande (Etheostoma grahami) ***
T	Dolphin, Atlantic spotted (Stenella frontalis)
T	Dolphin, rough-toothed (Steno bredanensis)
T	Eagle, bald (Haliaeetus leucocephalus)
T	Egret, reddish (Egretta rufescens)
E	Falcon, northern aplomado (Falco femoralis septentrionalis)
E	**Falcon, peregrine (Falco peregrinus) ***
E	**Falcon, American peregrine (Falco peregrinus antatum) ***
T	**Falcon, arctic peregrine (Falco peregrinus tundrius) ***
E	Ferret, black-footed (Mustela nigripes)
E	**Flycatcher, southwestern willow (Empidonax traillii extimus) ***
T	Frog, sheep (Hypopachus variolosus)
T	Frog, white-lipped (Leptodactylus labialis)
E	**Gambusia, Big Bend (Gambusia gaigei) ***
T	**Gambusia, blotched (Gambusia senilis) ***
E	Gambusia, Clear Creek (Gambusia heterochir)
E	Gambusia, Pecos (Gambusia nobilis)
E	Gambusia, San Marcos (Gambusia georgei)
T	**Gecko, reticulated (Coleonyx reticulatus) ***
T	Goby, blackfin (Gobionellus atripinnis)
T	Goby, river (Awaous banana)
T	**Hawk, gray (Asturina nitidus plagiata) ***
T	**Hawk, white-tailed (Buteo albicaudatus) ***
T	**Hawk, zone-tailed (Buteo albonotatus) ***
T	Ibis, white-faced (Plegadis chihi)
E	Jaguar (Panthera onca)
E	Jaguarundi (Felis yagouaroundi)
T	Kite, swallow-tailed (Elanoides forficatus)
T	**Lizard, mountain short-horned (Phrynosoma hernandesi) ***

T	**Lizard, reticulate collared (Crotaphytus reticulatus) ***
T	**Lizard, Texas horned (Phrynosoma cornutum) ***
E	Manatee, West Indian (Trichechus manatus)
T	Margay (Felis wiedii)
T	**Minnow, Devils River (Dionda diaboli) ***
E	Minnow, Rio Grande silvery (Hybognathus amarus)
T	Mouse, Palo Duro (*Peromyscus truei comanche*)
E	Mussel, Ouachita Rock pocketbook (Arkansia wheeleri)
T	Newt, black-spotted (Notophthalmus meridionalis)
E	**Ocelot (Leopardus pardalis) ***
T	Owl, cactus ferruginous pygmy (Glaucidium brasilianum cactorum)
T	**Owl, Mexican spotted (Strix occidentalis lucida) ***
T	Paddlefish (Polyodon spathula)
T	Parula, tropical (Parula pitiayumi nigrilora)
E	Pelican, brown (Pelecanus occidentalis)
T	Pipefish, opossum (Microphis brachyurus)
T	Plover, piping (Charadrius melodus)
E	Prairie-chicken, Attwater's greater (Tympanuchus cupido attwateri)
T	**Pupfish, Conchos (Cyprinodon eximius) ***
E	Pupfish, Comanche Springs (Cyprinodon elegans)
E	Pupfish, Leon Springs (Cyprinodon bovinus)
T	**Pupfish, Pecos (Cyprinodon pecosensis) ***
T	Racer, speckled (Drymobius margaritiferus)
T	Rat, Texas kangaroo (*Dipodomys elator*)
T	Rat, Coues' rice (*Oryzomys couesi*)
T	Rattlesnake, timber (canebrake) (Crotalus horridus)
E	Salamander, Barton Springs (Eurycea sosorum)
T	Salamander, Blanco blind (Eurycea robusta)
T	Salamander, Cascade Caverns (Eurycea latitans)
T	Salamander, Comal blind (Eurycea tridentifera)
T	Salamander, San Marcos (Eurycea nana)
E	Salamander, Texas blind (Typhlomolge rathbuni)
T	Sea turtle, green (Chelonia mydas)
E	Sea turtle, Atlantic hawksbill (Eretmochelys imbricata)
E	Sea turtle, Kemp's ridley (Lepidochelys kempii)
E	Sea turtle, leatherback (Dermochelys coriacea)
T	Sea turtle, loggerhead (Caretta caretta)
T	Shiner, Arkansas River (Notropis girardi)
T	Shiner, bluehead (Pteronotropis hubbsi)
T	**Shiner, bluntnose (Notropis simus) ***
T	**Shiner, Chihuahua (Notropis chihuahua) ***
T	**Shiner, Proserpine (Cyprinella proserpina) ***
T	Siren, south Texas (Siren sp.)
T	**Snake, Big Bend blackheaded (Tantilla cucullata) ***
T	Snake, black-striped (Coniophanes imperialis)
T	Snake, Brazos water (Nerodia harteri)
T	**Snake, indigo (Drymarchon corais) ***
T	Snake, Louisiana pine (Pituophis ruthveni)
T	Snake, northern cat-eyed (Leptoderia septentrionalis)
T	Snake, scarlet (Cemophra coccinea)
T	Snake, smooth green (Liochlorophis vernalis)
T	**Snake, Texas lyre (Trimorphodon) ***
T	Sparrow, Bachman's (Aimophila aestivalis)
T	Sparrow, Arizona Botteri's (Aimophila Botterii arizonae)
T	Sparrow, Texas Botteri's (Aimophila Botterii texana)
T	**Stoneroller, Mexican (Campostoma ornatum) ***

T **Stork, wood (Mycteria Americana) ***
T Sturgeon, shovelnose (Scaphirhynchus platorynchus)
T **Sucker, blue (Cycleptus elongates) ***
E **Tern, least (interior pop.) (Sterna antillarum) ***
T Tern, sooty (Sterna fuscata)
E Toad, Houston (Bufo houstonensis)
T Toad, Mexican burrowing (Rhinophrynus dorsalis)
T **Tortoise, Texas (Gopherus berlandieri) ***
T Treefrog, Mexican (Smilisca baudinii)
T Turtle, alligator snapping (Macroclemys temminckii)
T Turtle, Cagle's map (Graptemys caglei)
T **Turtle, Chihuahuan mud (Kinosternon hirtipes) ***
T Tyrannulet, northern beardless (Camptostoma imberbe)
E **Vireo, black-capped (Vireo atricapillus) ***
E Warbler, Bachman's (Vermivora bachmanii)
E Warbler, golden-cheeked (Dendroica chrysoparia)
E Whale, black right (Eubalaena glacialis)
E Whale, blue (Balaenoptera musculus)
T Whale, dwarf sperm (Kogia simus)
T Whale, false killer (Pseudorca crassidens)
E Whale, finback (Balaenoptera physalus)
T Whale, Gervais' beaked (Mesoplodon europaeus)
T Whale, goose-beaked (Ziphius cavirostris)
T Whale, killer (Orcinus orca)
T Whale, pygmy killer (Feresa attenuate)
T Whale, pygmy sperm (Kogia breviceps)
T Whale, short-finned pilot (Globicephala macrorhynchus)
E Whale, sperm (Physeter macrocephalus)
E **Wolf, grey (Canis lupus) ***
E Wolf, red (Canis rufus)
E Woodpecker, ivory-billed (Campephilus principalis)
E Woodpecker, red-cockaded (Picoides borealis)

Plants – 28
E Ambrosia, south Texas (Ambrosia cheiranthifolia)
E Ayenia, Texas (Ayenia limitaris)
E Bladderpod, white (Lesquerella pallida)
E Bladderpod, Zapata (Lesquerella thamnophila)
E Cactus, black lace (Echinocereus reichenbachii albertii)
T **Cory cactus, bunched (Coryphantha ramillosa) ***
T **Cactus, Chisos Mountain. hedgehog (Echinocereus chisoensis chisoensis) ***
T **Cactus, Lloyd's Mariposa (Echinomastus mariposensis) ***
E **Cactus, Nellie cory (Coryphantha minima) ***
E Cactus, Sneed pincushion (Coryphantha sneedii sneedii)
E Cactus, star (Astrophytum asterias)
E **Cactus, Tobusch fishhook (Ancistrocactus tobuschii) ***
E **Cat's-eye, Terlingua Creek (Cryptantha crassipes) ***
E Dawn-flower, Texas prairie (Hymenoxys texana)
E Dogweed, ashy (Thymophylla tephroleuca)
E Frankenia, Johnston's (Frankenia johnstonii)
E Ladies'-tresses, Navasota (Spiranthes parksii)
E Manioc, Walker's (Manihot walkerae)
T Oak, Hinckley (Quercus hinckleyi)
E Phlox, Texas trailing (Phlox nivalis texensis)
E **Pitaya, Davis' green (Echinocereus viridiflorus davisii) ***
E Pondweed, Little Aguja Creek (Potamogeton clystocarpus)

E Poppy-mallow, Texas (Callirhoe scabriuscula)
E Rush-pea, slender (Hoffmannseggia tenella)
E Sand-verbena, large-fruited (Abronia macrocarpa)
E Snowbells, Texas (Styrax texanus) *
T Sunflower, Pecos (Helianthus paradoxus)
E Wild-rice, Texas (Zizania texana)

*** State Listed Threatened and Endangered Species for the Texas counties of Val Verde, Brewster, Hudspeth, and Culberson.**

APPENDIX E
SCOPING NOTICE

National Park Service
U.S. Department of the Interior

Amistad National Recreation Area
Big Bend National Park
Guadalupe Mountains National Park

Oral Rabies Vaccination Program
September 25, 2002

The U.S. Department of Interior (USDI), National Park Service (NPS), in cooperation with the U.S. Department of Agriculture (USDA), Animal Plant Health Inspection Service, Wildlife Services (APHIS-WS) and the Texas Department of Health (TDH), is proposing to implement an oral rabies vaccination (ORVAC) program at Big Bend National Park (BBNP), Guadalupe Mountains National Park (GMNP), and Amistad National Recreation Area (ANRA) in west-central Texas to stop the spread of specific gray fox (*Urocyon cinereoargenteus*) rabies variants or "strains" of the rabies virus.

To evaluate alternatives and determine environmental consequences, we will be preparing an environmental assessment for this project. We would like to hear your concerns regarding the implementation of the proposed program and welcome your input in understanding issues and developing alternatives for resolving gray fox rabies on BBNP, GMNP, and ANRA.

PROJECT BACKGROUND

Gray Fox Rabies Virus in Texas
Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal. The disease can be effectively prevented in humans and many domestic animal species, but abundant and widely distributed reservoirs among wild mammals complicate rabies control. Within most of the U.S., these reservoirs occur in geographically discrete regions where the virus transmission is primarily between members of the same species. These species include but are not limited to raccoons, coyotes, skunks, and foxes. Species specific variants of the virus may be transmitted to other animal species. However these encounters rarely result in sustained virus transmission within that animal species. Once established, virus transmission within a specific animal species can persist at epidemic levels for decades, even perhaps for centuries.

Gray fox rabies is defined as a species specific variant of the rabies virus that is adapted to gray foxes. It does not include rabies transmitted to foxes from other variants of the rabies virus. Two geographically distinct reservoirs of the gray fox variant are found in the U.S. One located in west-central Texas and the other in Arizona. Modern molecular typing suggests that the remnant of gray fox rabies in Texas is the historical aftermath of an introduction of Old World rabies virus from dogs.

In 1946, an epidemic of fox rabies began in East Texas and spread southwesterly through 1955. During the 1960's fox rabies disappeared from eastern portions of Texas and became localized and prevalent during the 1970's and 80's in West Texas. In 1988, gray fox rabies became epidemic in West Central Texas. From a starting point near Sonora, Texas in Sutton County in 1988, an epidemic of gray fox rabies cases expanded 80 miles northward and 140 miles eastward. This particular strain infected domestic cats and dogs and was readily transmitted to raccoons and to livestock, especially cows and goats. Rabies outbreaks

involving domestic animals greatly increase the risk of human exposure which heightened the seriousness of this particular epidemic from a public health standpoint. In 1994, the public health threat created by the expanding gray fox epidemic prompted the Governor of Texas to declare rabies a public health emergency in the state.

Oral Rabies Vaccine

The oral rabies vaccine that would be used in this program is the genetically engineered recombinant vaccinia-rabies glycoprotein (Raboral V-RG® MERIAL, Inc.) vaccine currently USDA licensed for use in raccoons in the U.S. and USDA approved for experimental use in gray fox and coyotes in Texas. It has been used extensively and successfully in Europe to combat fox rabies. This vaccine is contained in baits which are distributed by aircraft (fixed-wing airplane or helicopter) and by ground placement. When animals find and ingest the bait they receive a single dose of the vaccine. The vaccine has been found to be safe for use in a number of animal species including gray fox. This vaccine was extensively laboratory-tested for safety in more than 50 animal species with no adverse effects regardless of route or dose. In addition, a domestic animal's annual rabies vaccination can be safely administered even if it recently ingested a dose of oral rabies vaccine.

There is no possibility of vaccine-induced rabies with V-RG because the vaccine only contains the non-infective surface protein of the rabies virus; none of the viral nuclear material (i.e., RNA) which would be required for the rabies virus to replicate is present in the vaccine. Over 23 million doses have been distributed in the U.S. since 1990 with only one case of vaccinia virus infection reported in humans (resulting in localized skin rashes) to date.

The ORVAC baits that would be used are small blocks of dog food that are held together with a polymer binding agent and are considered to be "food grade" materials. The baits weigh approximately 1 ounce and measure 11/4 x 11/4 x 3/4 inches. The sachet[4] containing the liquid vaccine is contained in a hollow center in the middle of the bait. When foxes eat the oral rabies baits and puncture the sachet containing the vaccine, the vaccine is swallowed and bathes the lymphatic tissue in the throat area and initiates the immunization process. The sachet is composed of a thin plastic material that is not readily digested by the animal ingesting the bait and is subsequently passed through the animal's digestive tract.

Each individual bait would have a warning label advising persons not to handle or disturb the bait along with a toll-free telephone number to call for further information. Baits may contain a non-toxic biomarker (e.g., tetracycline, iophenoxic acid) to aid in determining whether animals collected for monitoring purposes have eaten one or more ORVAC baits. However no animals will be collected for monitoring purposes on BBNP, GMNP, or ANRA.

Goals of the ORVAC program

The primary goals of the program are to: 1) stop the forward advance of the gray fox strain of rabies from areas where they now occur by immunizing portions of target species populations along the leading edges of the rabies fronts; and 2) reduce the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans in the areas where the ORVAC programs are conducted. If the ORVAC program is successful in stopping the forward advance of these strains, then the ultimate goal could include elimination of these rabies variants.

PURPOSE AND NEED

The proposed program would distribute ORVAC baits at BBNP, GMNP, and ANRA to support and cooperate with the state of Texas in their ongoing efforts of eliminating or stopping the forward spread of gray fox rabies in West-Central Texas. If new rabies strains such as those transmitted by gray foxes are not prevented from spreading to new areas of Texas and the U.S., the health threats and costs associated with rabies are expected to increase substantially as broader geographic areas of the U.S. are affected. Livestock and domestic animals in these areas would be at risk to exposure and more importantly, if gray fox strains

[4] A thin plastic packet much like those in which condiments (e.g., catsup, mustard) are provided at fast food restaurants.

of rabies infect a much broader geographic area, human health care concerns would be expected to increase substantially as well.

PROPOSED ACTION

The proposed program would involve the distribution of ORVAC baits at BBNP, GMNP, and ANRA to create zones of vaccinated target species that would then serve as barriers to cease the further advancement of gray fox rabies virus variants. Vaccination zones would be determined in cooperation with the state rabies task force, TDH, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve use of APHIS-WS federal funds to purchase and distribute ORVAC baits.

On an annual basis, one treatment of ORVAC baits would be distributed by aircraft (fixed-wing airplane or helicopter) and ground placement. The annual treatment would continue on a reoccurring basis until the goals of the ORVAC program have been met. Baits would be distributed at an average density of 100 baits per square mile during the month of January. Air drops would be typically conducted at about 500 feet above ground level and would only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution.

ALTERNATIVES

Two preliminary alternatives were developed by an internal scoping process. Those alternatives include:

- the proposed action (described above); and
- a no action alternative. The no action alternative would preclude any involvement by NPS in rabies prevention or control at BBNP, GMNP, or ANRA.

Do you have any ideas to share about these alternatives? Are there any other alternatives you think we should consider?

_____
_____
_____
_____
_____

RESOURCE ISSUES/CONCERNS

Preliminary issues identified by an internal scoping process include:

- Potential for adverse effects on people that become exposed to the vaccine or the baits.
- Effects of the ORVAC V-RG vaccine on gray foxes.
- Potential for adverse effects on nontarget wildlife species, including threatened or endangered species.
- Potential for adverse effects on pet dogs or other domestic animals that might consume the baits.
- Potential for the recombined V-RG virus to "revert to virulence" and result in a virus that could cause disease in humans or animals.
- Potential for the V-RG virus to recombine with other viruses in the wild to form new viruses that could cause disease in humans or animal.
- Potential for aerially dropped baits to strike and injure people or domestic animals.
- Potential effects on NPS wilderness areas.
- Potential impacts on water resources.
- Potential impacts on visitor use/experience.

Do you have other issues you wish to see addressed or information about the project you like to provide?

_____
_____
_____
_____
_____
_____
_____

Please send your scoping comments to:
David S. Reinhold
Environmental Coordinator
USDA-APHIS-Wildlife Services
6213-E Angus Drive
Raleigh, NC 27617
Phone (919) 786-4479
Fax (919) 782-4159

Please submit your written comments by November 1, 2002 to receive full consideration in the environmental assessment. Faxed comments should also be mailed.

If you would like to receive a copy of the environmental assessment when it becomes available for review please be sure to include your name and mailing address with your comments.

Please note that names and addresses of people who comment become part of the public record. If you wish us to withhold your name and address, you must state this prominently at the beginning of your comments. We will make submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

APPENDIX F
SCOPING NOTICE – PRESS RELEASE

National Park Service
U.S. Department of the Interior

Amistad National Recreation Area
Big Bend National Park
Guadalupe Mountains National Park

PRESS RELEASE

Oral Rabies Vaccination Program
September 25, 2002

The U.S. Department of Interior, National Park Service, in cooperation with the U.S. Department of Agriculture, Animal Plant Health Inspection Service, Wildlife Services and the Texas Department of Health, is proposing to implement an oral rabies vaccination program at Big Bend National Park, Guadalupe Mountains National Park, and Amistad National Recreation Area in west-central Texas to stop the spread of specific gray fox rabies strains of the rabies virus.

To evaluate alternatives and determine environmental impacts of this proposed program, we will be preparing an environmental assessment for the project. We would like to hear your concerns regarding the implementation of the proposed program and welcome your input in understanding issues and developing alternatives for resolving gray fox rabies on these three National Park Service properties.

For a copy of the newsletter describing the proposed project or more information please contact:

David S. Reinhold
Environmental Coordinator
USDA-APHIS-Wildlife Services
6213-E Angus Drive
Raleigh, NC 27617
Phone (919) 786-4479
Fax (919) 782-4159

Please submit your written comments by November 1, 2002 to receive full consideration in the environmental assessment. Faxed comments should also be mailed.

Please note that names and addresses of people who comment become part of the public record. If you wish us to withhold your name and address, you must state this prominently at the beginning of your comments. We will make submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

APPENDIX G
LETTERS OF CONCURRENCE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
(512) 490-0057

December 11, 2002

Wendy Servoss
United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services
6213 Angus Drive, Suite E
Raleigh, North Carolina 27617

Consultation # 2-15-2003-I-0098

Dear Ms. Servoss:

Thank you for your letter dated November 26, 2002, and associated Environmental Assessment (EA) requesting informal consultation with the U.S. Fish and Wildlife Service (Service) regarding the proposed plan to drop oral rabies vaccine (ORV) baits by aircraft on National Park Service (NPS) lands in West-Central Texas. Specifically, baits will be dropped at Big Bend National Park in Brewster County, Guadalupe Mountains National Park in Culberson and Hudspeth Counties, and Amistad National Recreation Area in Val Verde County.

A list of federally listed species for Brewster, Culberson, Hudspeth, and Val Verde Counties is enclosed for your reference. The only listed mammal species known to occur in the project area is the Mexican long-nosed bat (*Leptonycteris nivalis*). This species is a medium-sized (2.75-3.75 inches long) bat that has been known to occur in Mt. Emory Cave in Big Bend National Park (BBNP). They are generally nectivorous, feeding on agave cactus fruits, but may incidentally feed on insects. They may travel to BBNP from their primary habitat in northern Mexico to feed and forage, particularly when agave flower and fruit production are low in Mexico due to drought conditions.

One study in 1962 by Villa-R and Jimenez suggests that rabies may be present in this species (Service, 1994). However, there is doubt that the taxonomic identification in this study was correct and, in fact, the individuals they identified with rabies belonged to a closely related species. We believe that if rabies does exist in Mexican long-nosed bats, any incidental feeding on ORV baits could possibly serve to immunize these individuals for the rabies virus and would probably not induce mortality due to the nature of the vaccine. The results of Rupprecht et al. (1992) suggests that the ORV baits have been extensively tested over a broad range of taxonomic groups with no apparent adverse affects on any species, possibly due to the fact that the ORV baits do not contain live rabies virus, but rather a recombinant rabies glycoprotein vaccine. As a result of these facts, we believe that dropping ORV baits on NPS lands in West-central Texas will not adversely affect the Mexican long-nosed bat.

The study by Rupprecht et. al included testing the baits on several avian species, including four in the Order falconiformes and one in the Order strigiformes. No negative effects were observed in any of these species. As a result, we believe there should not be effects on the Northern aplomado falcon or the Mexican spotted owl.

In addition, we believe this project should not affect any of the other species listed for Brewster, Culberson, Hudspeth, or Val Verde counties. It is very unlikely these additional species would have contact or otherwise consume ORV baits in their natural environment.

We appreciate the chance to comment on this project for the United States Department of Agriculture and the National Park Service. If you have any additional questions or comments relating to this project, please contact Jana Milliken at 512-490-0057 extension 243. Please refer to the consultation number listed above with all future correspondence.

Sincerely,

E. Dawn Whitehead

for Robert T. Pine
Supervisor

Enclosure

U.S. Fish and Wildlife Service. 1994. Recovery Plan for the Mexican long-nosed bat (*Leptonycteris nivalis)* Region 2. Albuquerque, New Mexico.

Repprecht, C.E., C.A. Hanlon, H. Koprowski, and A.N. Hamir. 1992. Oral wildlife rabies vaccination: development of a recombinant virus vaccine. Transactions of the 57th North American Wildlife & Natural Resource Conference. Washington, D.C. P. 439 - 452.

USDA

United States Department of Agriculture | Animal and Plant Health Inspection Service | Wildlife Services | 6213 Angus Drive Suite E Raleigh, NC 27617

December 2, 2002

Mr. Larry Oaks
Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

Dear Mr. Oaks:

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS) requests consultation regarding the potential effects on historic resources in a proposed project to drop oral rabies vaccine (ORV) baits on National Park Service (NPS) lands in West-Central Texas by January, 2003.

APHIS-WS currently has a national programmatic Environmental Assessment (EA) and Decision/Finding of No Significant Impact (May 5, 2002) that analyses the potential environmental effects of a proposal to continue and expand the involvement of APHIS-WS in cooperative ORV programs in a number of states, including Texas (see Attachments). Through the programmatic EA and Decision, APHIS-WS determined that the actions to be taken did not constitute undertakings that had the potential to affect historic resources.

The proposed program would distribute ORV baits at Big Bend National Park, Guadalupe Mountains National Park, and Amistad National Recreation Area to support and cooperate with the Texas Department of Health in their ongoing efforts to eliminate or stop the forward spread of gray fox rabies in West-Central Texas. The oral rabies vaccine that would be used in this program, as in past programs, is the genetically engineered recombinant vaccinia-rabies glycoprotein (Raboral V-RG® MERIAL, Inc.) vaccine currently USDA-licensed for use in raccoons in the U.S. and USDA-approved for experimental use in gray fox and coyotes in Texas. This vaccine is contained in small dog-food type baits which are distributed by aircraft (fixed-wing airplane or helicopter) and by ground placement. Each animal that finds and ingests a bait receives a single dose of the vaccine. The ORV program would reduce the likelihood of wildlife being exposed to the rabies virus.

The NPS lands involved would have one bait application per year. One aircraft would be used to distribute the baits using a Geographic Positioning System for navigation. The aircraft would be flown at more than 500 feet above ground level. The attached EA provides additional details if you need them.

USDA

According to the National Historical Preservation Act (NHPA) of 1966 as amended, the NHPA and its Implementing Regulations require federal agencies to determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties. APHIS-WS believes the activities to be conducted on NPS lands in the proposed program will not cause major ground disturbance or other adverse impacts on historic resources and are not undertakings as defined by the NHPA.

In an attempt to reach goals for dropping baits on NPS lands by January, 2003, APHIS-WS would greatly appreciate a written response within 20 days of receipt of this letter. If you have further questions or need additional information, please contact me at (919) 786-4480 ext. 229. Thank you for your assistance in this matter.

Sincerely,

Wendy Servoss
Environmental Management Coordinator
APHIS-WS Rabies Management Program

Attachments

cc:
Dennis Slate, National Rabies Coordinator, APHIS-WS
Michael Worthen, Western Regional Director, APHIS-WS
Gary Littauer, National Environmental Manager, APHIS-WS
Chris Turk, National Park Service
Guy Moore, Texas Department of Health
Gary Nunley, Texas State Director, APHIS-WS

CONCUR
by _____
for F. Lawerence Oaks
State Historic Preservation Officer
Date 12-10-02

NO HISTORIC
PROPERTIES AFFECTED
PROJECT MAY PROCEED
By _____
for F. Lawerence Oaks
State Historic Preservation Officer
Date 12-10-02

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